COAL AGE

JUNE, 1959
PRICE $1

Management of Today ... p 74

A McGRAW-HILL PUBLICATION

Modern Dust Control . . . p 92

MSA's continuous MinePhone research and development assures dependable underground communication in mines and areas previously thought inaccessible for this type of equipment.

Built-in → quality here

increases safety and dependability here

The motorman has clear, instant voice communication with the dispatcher or other motormen while trips are moving.

M-S-A MinePhone helps mine operators gain and maintain fast, high-capacity haulage schedules

Briefly, here's how the M-S-A® MinePhone helps keep haulage schedules abreast of production in today's mechanized mines.

The MinePhone coordinates trip traffic for safe, fast, productive haulage control. Trip control avoids excessive power loads for economical operation. Assures better distribution of cars for peak loading efficiency.

Further, a MinePhone system reduces frequency of motormen and trip riders getting on and off trips. This saves time. Minimizes chances of injury. Reduces wear and tear on haulage equipment caused by excessive stopping and starting.

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Your MSA representative would be pleased to arrange a demonstration for you. Call him in for an evaluation of your communication needs. And write us for informative literature on the MinePhone.

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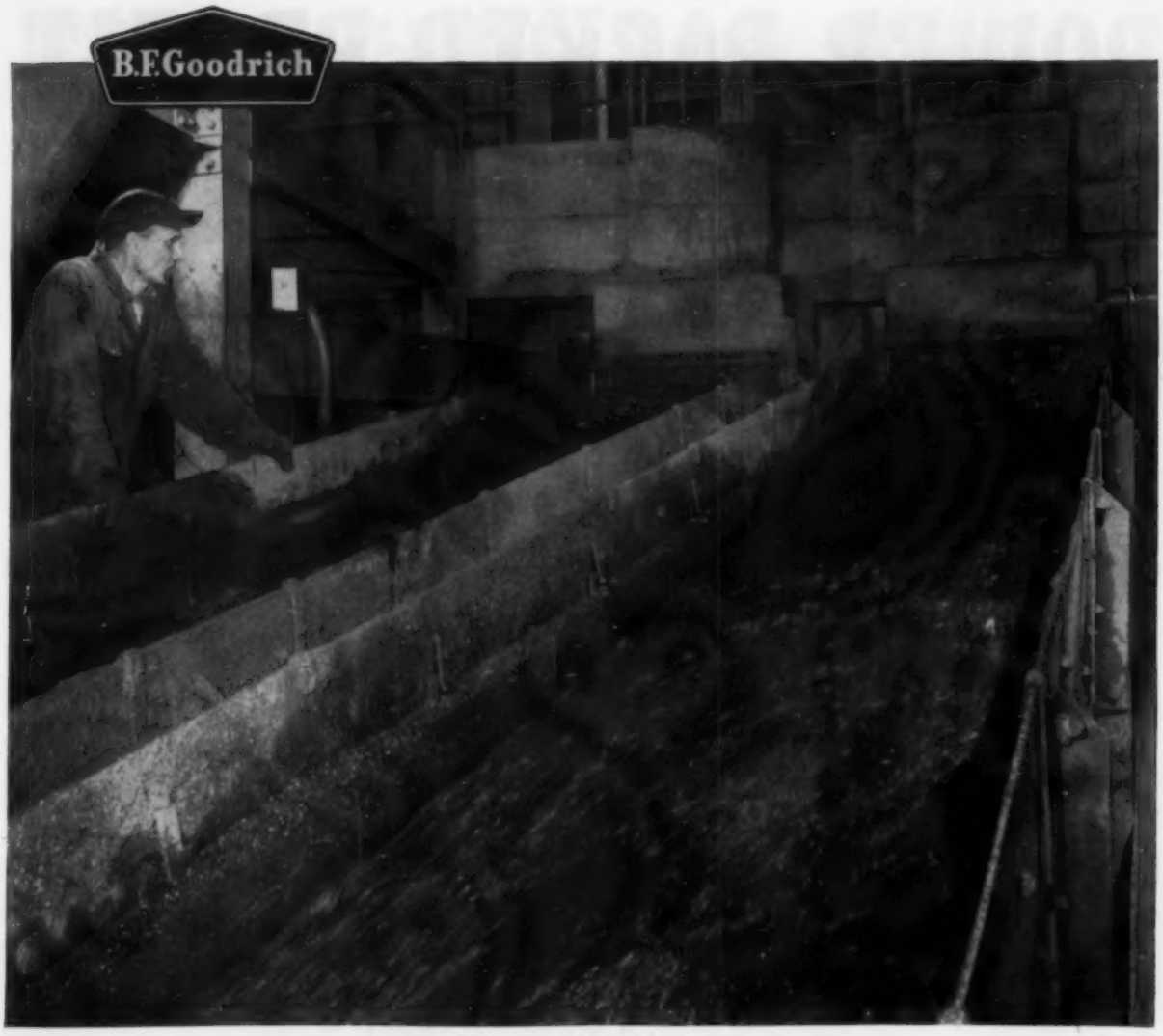

Rubber lining stops twice-a-year chute replacements

THE needle-sharp bits of hard coal and acid water in that coal slurry were wearing out steel chutes in only six months. Repairing and replacing the chutes was not only costly, but also caused the plant to shut down and lose production time.

When a B.F.Goodrich distributor heard of the problem, he recommended that the chute be lined with a special kind of B.F.Goodrich sheet rubber called Armorite. It's made of rubber especially compounded to stand terrific abrasion and resist most acids. The rubber used in Armorite is so tough it's even used in some places to handle broken glass.

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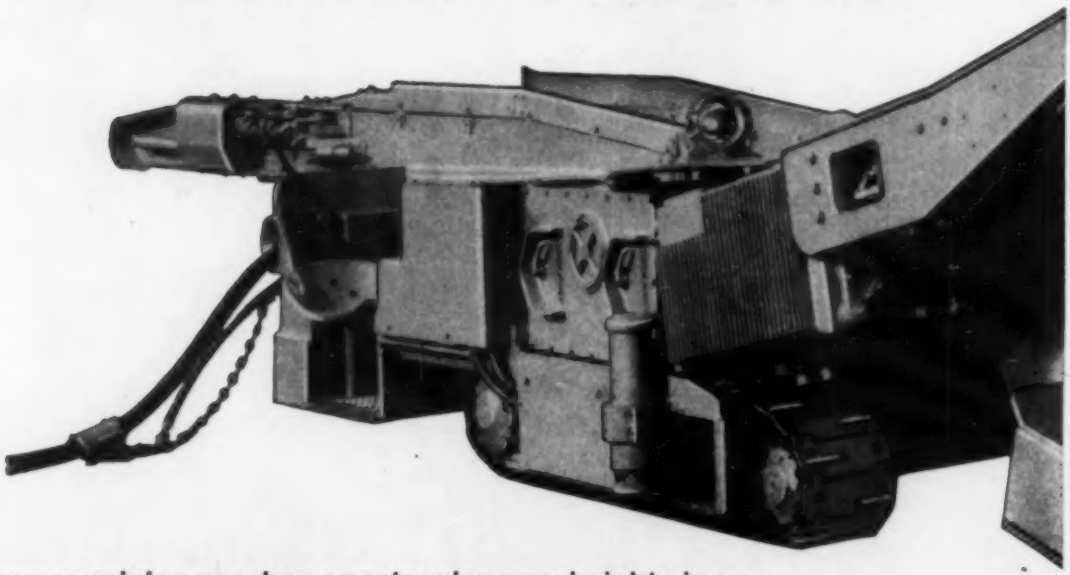
Lee-Norse CM37X and

The only miner that combines modern loading with advanced cutting techniques

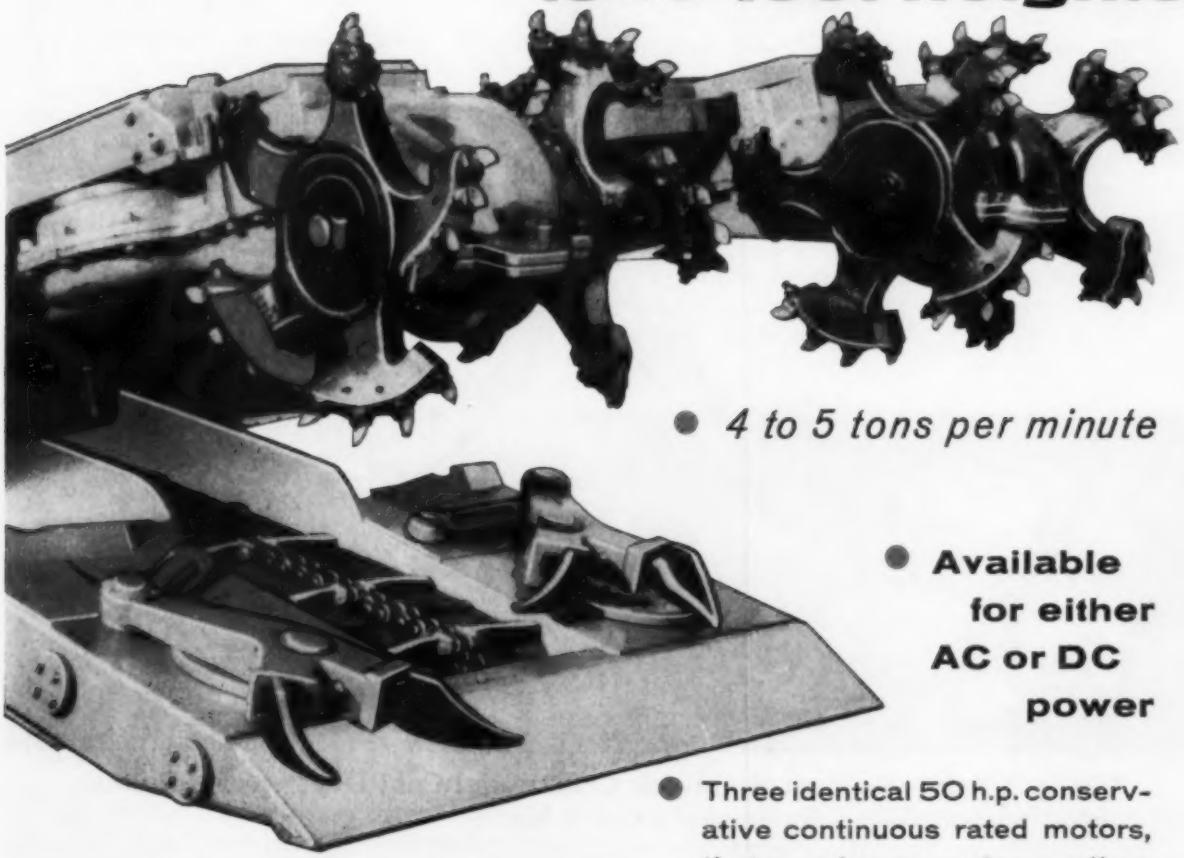


- Continuous mining reaches spectacular new heights in operational efficiency with each of these new and exclusively engineered heavy duty Lee-Norse Miners.

- Now power-packed precision action teams with increased capacity and faster "overdrive" tramming speed to produce rapid-fire tonnage

PRODUCERS FOR 1959

CM47X ... mining 42 inch to 10 foot heights



- *4 to 5 tons per minute*
- **Available for either AC or DC power**
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- Controlled multiple tramming speed — variable to 50 feet per minute, with "overdrive" at 90-100 feet per minute.

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BIRD MACHINE'S 50th YEAR OF SERVICE TO INDUSTRY

This Month in COAL AGE

JUNE 1959

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► Management Development

How to Modernize Coal Management .... p 74

W. A. Raleigh Jr., Associate Editor, *Coal Age*

Adapting to the long-term outlook is the basis of modernized planning for growth and profits-stability. Regardless of size, every company can put modernized planning into action by streamlining its existing organization. This means identifying and giving adequate recognition to all managerial functions, clearly defining responsibilities and lines of authority, striking a proper balance in staff-line relationships, preparing for change, and seeking an effective distribution of work loads. Also needed is wider use of certain operating techniques critical to achieving a workable system of managerial development, more scientific attack on cost control and equipment policy, and more effective communications. Integrated, streamlined management is the ultimate goal.

Featured—The key to growth and profits; Penn State Workshops pioneer in management training.

► Diesel-Engine Maintenance

Planned Maintenance Extends Equipment Life, Reduces Downtime ..... p 82

Scheduled maintenance backed by top management is paying big dividends at Hanna Coal's giant Georgetown strip mine. A typical result of the program is 20,000 hr of operation by big 400-hp diesel engines before overhaul. This is double the life of most on-highway diesels operating under much more favorable conditions. Carl Rogers, Georgetown maintenance superintendent, lists the following keys to successful maintenance: (1) top management believes in preventive maintenance and provides adequate facilities; (2) trained maintenance men; (3) skilled machine operators; and (4) cooperation between maintenance and operating men.

Extras—Special rules developed to keep dirt out of engines; how engine abuse is prevented; how special cost charts aid maintenance.

► Deep Mining

"Truck-Mine"-Designed Cutting Machine Boosts Efficiency in Low Seams ..... p 90

New cutting machine developed especially for truck mines in seams as low as 24 in increases production, cuts cost. Outstanding features of the machine are maneuverability, low operating and maintenance costs, and high-speed cutting. It is a self-propelled bottom cutter with hydraulically powered wheels which can be raised or lowered for tramming or cutting on the bottom. The machine can be powered by 230-V single-phase AC, 230-V three phase AC, 250-V DC and storage-battery current.

Illustrated—Detailed diagram shows special features of machine.

► Dust Collection

Better Dust Collection With A Packaged Unit ..... p 92

C. S. Cressman, Chief Engineer, and **J. C. White,** Div. Superintendent, Bethlehem Mines Corp.

Improved working conditions, good housekeeping and safety, reduced man-hour requirements for clean-up work and lower maintenance costs are benefits of

(*Continued on p 7*)

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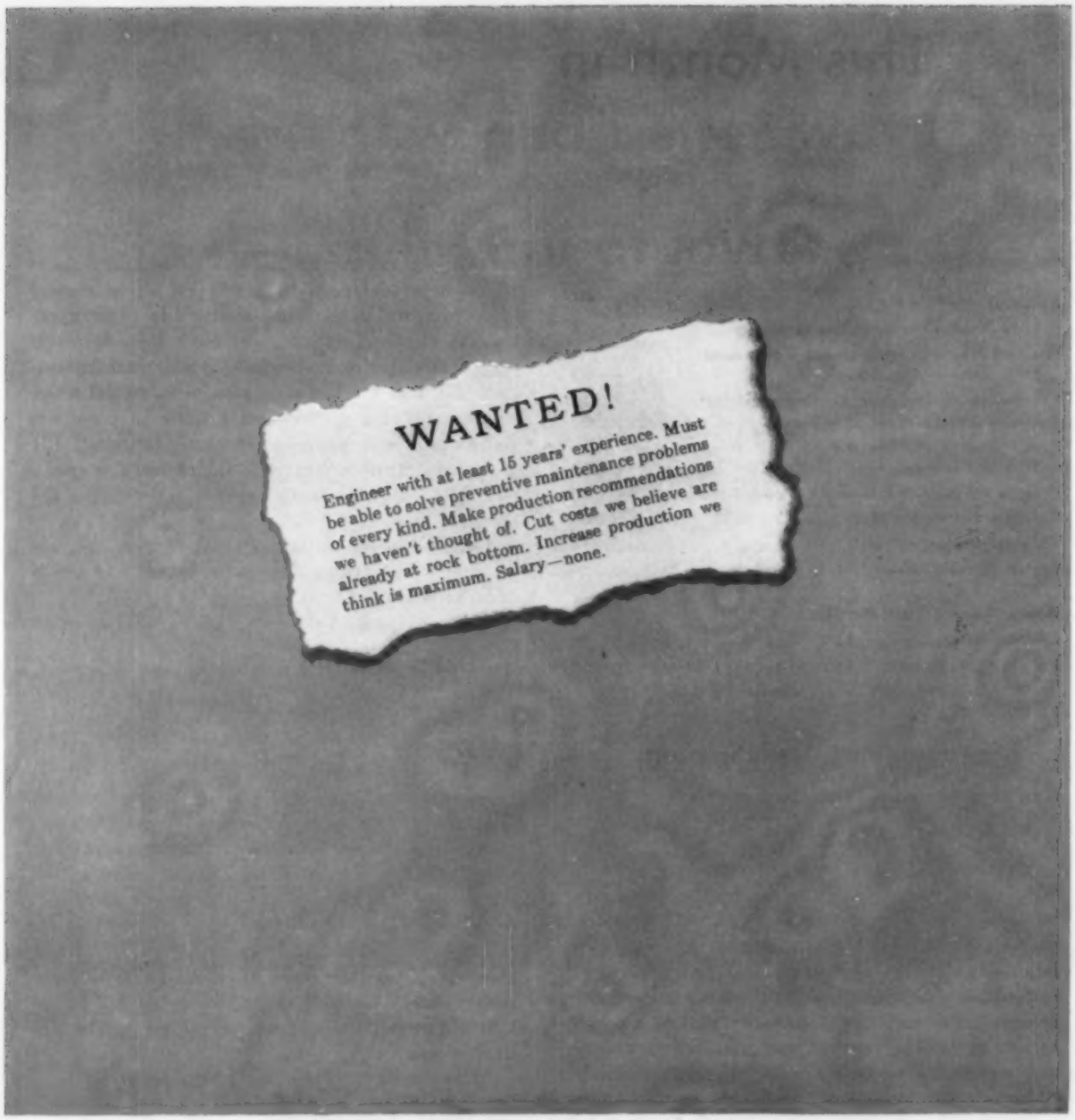
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Engineer with at least 15 years' experience. Must be able to solve preventive maintenance problems of every kind. Make production recommendations we haven't thought of. Cut costs we believe are already at rock bottom. Increase production we think is maximum. Salary—none.

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a new wet-type dust-collector installation at the preparation plant of Mine No. 31, Bethlehem Mines Corp. The packaged unit collects dust from the rotary dump, breaker and belt transfer stations. The single-unit system was preferable because:

1. The disposition of sludge would be much easier since it would be deposited at one point.
2. The space available for the dust collector would enable it to be located in the pneumatic center.
3. The cost of a single-unit system would be considerably less.
4. At no time would either unit function without the other if the dual-unit system was adopted.

Bonus—Installation diagram; wiring diagram; and photos.

► Electric Power

Designs for Safe, Efficient AC Power Systems ..... *p 98*

D. E. Hamilton, Electrical Engineer, General Electric Co., Schenectady, N. Y.

One of the factors governing the safety of personnel in AC-powered mines is the need of maintaining continuity of the ground-fault current path between the underground equipment and the surface substation protective ground. Circuits have been developed which continuously monitor the continuity of the ground circuit. This system has three advantages, as follows: It fails safe, it trips breakers without need for control power, and it is unaffected by changes in the length of feeder cable. Fig. 8 in the article shows this relay circuit.

Features—Photos and diagrams of major components in an AC power distribution system.

► Shop Facilities

Building for Better Mining ..... *p 108*

Sullivan Trail Coal Co., a growing anthracite producer, achieves full use of extensive shop facilities by setting up a program of building dragline buckets and truck bodies and rebuilding drill bits for overburden drills. Buckets are lighter in weight for given capacity. Truck bodies are 30-ton coal boxes, interchangeable with 21-ton rock bodies on Euclid haulers.

Extra Touch—Step-by-step sequence of rebuilding bits.

► Industry Statistics

Thermal Drying of Coal ..... *p 114*

W. H. Young, Chief, Bituminous Coal & Lignite

(*Continued on p 9*)

This Month in COAL

SLOW THIRD?—April brought the first firm evidence of the long-expected upturn in bituminous production. The uptrend became unmistakable in May with output pushing up toward 9 million tons a week, and continued into June. Consequently, it is expected that the first 6 mo will show a production gain of some 13 to 15 million tons or more. For the future this means that if the expected increase of 40 to 50 million for the year is to be attained the rate must step up sharply in the last half. Since present betting is that the third-quarter pace will not be greater than the second—and perhaps somewhat less—the final quarter will establish the final total—and indicate how accurate the start-of-the-year forecasting job was.

ANTHRACITE—Hard coal, after the cold-weather push at the start of the year, settled back to a "normal" rate in May, with the prospect that it would end the first 6 mo only slightly under 1958. No fireworks are expected in the third quarter, and the presence or absence of cold will tell the tale in the fourth. So anthracite could be off again in 1959. But it also, as of the moment, still has a chance—for the first time in many years—of equalling its previous year's output record.

PROFIT PROSPECTS—The increase in bituminous tonnage in the second quarter, bringing in more dollars, tended to offset the effects of the price cuts that ushered it in. Thus, though the average return per ton was down, many companies racked up a bigger total net. Meanwhile the drive to get costs down by increasing labor productivity continued to pick up steam. With some exceptions for some companies in some areas, the continued rise in output in the second half therefore should result not only in a good overall net but quite likely in a good net per ton in spite of a lower average value.

UP FOR COMPETITION—Though the imposition of mandatory controls cut the flood of crude and residual imports the level still is ahead of 1958. Consequently the residual burn along the Atlantic Coast is higher and will continue higher in the second half, though its inroads have been blunted to some extent in the utility field by the rail and coal reductions of April 1. Elsewhere, there were few or no changes in the residual picture, and none are in prospect in the immediate future. Gas continues to gain in the home and in the industrial and commercial fields at around its rate of some years standing—around 4% in the past 12 mo.

IN WASHINGTON—Prospects for certain bills in Congress of major interest to coal are:

Repeal of mandatory control of oil imports—No chance of passage. Easements to Canada and Mexico probably will not be extended to other countries.

Coal research commission and expansion of government research work—Could pass the Senate, but squeak will be narrow if it does.

Bond-issuing power for TVA—Probably not this session but quite likely eventually.

Additional funds for nuclear power-plant construction—Not likely this session.

Style GR, cylindrical insert

HR Style, 1½" gage stop

JN for continuous miners

HJN recovery auger bit

G Style, straight shank

Style GN, notched shank

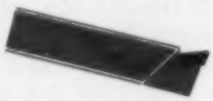
JC Colmol and Boring bit

GV, for Joy GV-6111 chain

KN Style, chisel-nose tip

HN Style, 1½" gage stop

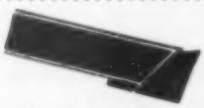
Style A straight shank



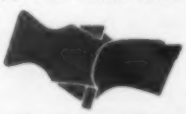
Style C for impurities

Style D for coal, potash, salt

Style E for Goodman Borers



Style CC, milled shank



L Style for Bowdil ML chains

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Carmet carbide mining tools get high-tonnage production because they're precision made to meet specific mining operations. Hard, tough grades of carbide are induction brazed to high alloy, heat treated shanks in a way that insures maximum tool life. Cutter bits are designed for shortwall, longwall, universal machines and continuous miners of every make. Drill bits drill clean, straight holes at fastest speeds. Carmet distributors keep a complete line of Carmet Mining Tools in stock for prompt delivery. Carmet field engineers are always on call to help you solve tool problems and cut mining costs. Take advantage of their know-how now.

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The newly revised 5th Edition of the Carmet Mining Tool Catalog contains application data and specifications on the complete line of Carmet Mining Tools, including a complete section on grinding and reconditioning. For your copy, write Carmet Division, Allegheny Ludlum Steel Corporation, Detroit 20, Michigan.

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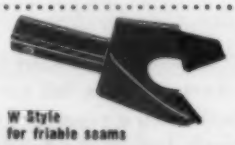
N Style special clearance bit

O Style for rotary head miners

R Style finger bits

Style UL coal drill

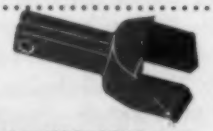
Style VL drill bit



W Style for friable seams

WW Style, power and hand drilling

T and TT Styles for roof bolting



S and SS Roof Bolting drills

The Original DOUBLE-BONDED Carbide Cutter Bit

CARMET

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WBW 7289

Section, and **R. L. Anderson,** Supervisory Commodity-Industry Analyst, U. S. Bureau of Mines.

About 11% of the washed coal in the United States is thermally dried. This percentage jumps to 46% in the State of Washington and 22% in Indiana. In 1957, almost 32 million tons of coal were thermally dried, over half of it in flash or fluidized bed systems and multilouvre units.

Table Topics—Types of driers, relation between size of feed and type of equipment, comparison of thermal drying with mechanical cleaning, and thermal drying capacity by states.

► Industry Affairs

Spring Meetings Roundup ..... *p 120*

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This Month in Mining Practice

MINER PLUS AUGER—Up to 15 deg or perhaps slightly more continuous-type machines have been quite successful in mining rooms and pillars in additon to driving the crosspitch gangways. On steeper pitches the machines necessarily have been limited to gangway work. Now, anthracite is pioneering, with the Bureau of Mines, a miner-auger setup as a means of overcoming the problems of operation on pitches between light and heavy. On the advance the miner drives the openings and the auger bores the crosscuts. On the retreat the auger will mine the coal up the pitch above the openings.

HOME-GROWN MEDIUM—Interest and activity in the generation of medium for dense-medium separators from plant refuse has been showing a steady growth. Among the systems being used is one in Great Britain involving extraction of the medium from flotation tailings by means of cyclones making cuts at 60 and 250 mesh. Also included in the circuit are flotation units to remove the coal from the dilute medium from the rinse-and-drain screens and thus keep it from building up in the system.

CABLE NOTES—Substitutes for rubber continue to gain for various applications in the cable field. Neoprene, for example, is now being tested as another entry in the integral insulation-jacket field, where plastic already is in service in some volume. Plastic also is finding good use in splicing all types of cables and is showing excellent results. Neoprene is being used for constructing complete couplers for heavy continuous-miner cables, eliminating metal components. And in addition a new cable nip with a neoprene fuse housing lined with asbestos sheet can withstand a number of blows and still be serviceable.

MAINTENANCE KEYS—With maintenance crawling up on supplies, the latter now the second largest item in mine cost, the pressure for improvements continues on all fronts. As a result certain things are emerging as keys to progress. One is emphasis on machine design to increase basic resistance to wear and breakdown. In parallel, naturally, is stress on the organization of maintenance work, with the lion's share of attention on preventive measures. Effective organization involves careful study of the problem, the size of the working force, how it is organized and the qualifications of its members. Thus, use of industrial-engineering principles and effective training emerge as additional keys.

EDUCATION FOR SAFETY—Look for a new series of accident-prevention classes. These will emphasize the role of supervision, reflecting growing acceptance of the fact that personal participation is the key ingredient in eliminating accidents.

Safety Footnote—One authority contends that if the president or other top executive writes a letter and an order concerning a specific hazard, preferably observed in personal inspection, it is a lot more likely something will be done.

Truck operators derive many worthwhile benefits through the use of Eaton 2-Speed Axles—ability to pull out under full load, quicker trips, safer operation, reduced driver fatigue, longer truck life, greater trade-in value.

But a big reason why more and more truckers in all fields of heavy duty hauling are specifying Eaton 2-Speed Axles is that this equipment effects important reductions in operating and maintenance costs—which is another way of saying: they add to profits!

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The Coal Commentator

Man in Motion

"Never a dull moment" was not coined in the coal industry—at least as far as your commentator is aware—but is has been used often to describe living and working in it.

There's a reason. Coal's external—and internal—competition is of a force and scope almost without parallel. Consequently, dull moments are few. At the same time, however, the industry offers opportunities also almost without parallel—and with these opportunities outstanding chances for personal progress and achievement.

Because the penalties of stagnation are quicker and more severe in coal, and because the competition to cash in on the opportunities is faster and tougher, the mining man, from president on down, must be more on the ball and above all else fast on his feet.

He is a "Man in motion" and an "Architect of progress," always on the watch for new ideas in production, markets and public relations because he has to be. And of course he wants to be because motion with purpose pays off not only in money but in the good feeling of a real contribution to progress.

Isotopes Too

The more you know about how something takes place the better chance you have of getting the most out of it in cost, quality or whatever else you are seeking. Among the new tools for attaining more precise process knowledge are products of the nuclear age, including gamma-ray generators and isotopes.

The gamma ray already is in service in coal preparation as a means of determining the solids content of slurries in pipelines, and isotopes may soon be finding uses in research as a result of expected completion of arrangement between BCR and AEC. Abroad, the Germans are using isotopes to coat coal particles and thus check speed and flow patterns in pneumatic and hydraulic hoisting and pipelining, while the French are using them in drill heads to tell when coal is encountered. This is a major advantage in, for example, drilling to locate the vein in a fault zone.

And along with these developments there is the possibility of using the nuclear reaction to convert coal into a competitive pipeline gas.

Another Step

Hydraulic fluid is now one of the key supply items in coal, since practically all new machines use for part or all of their functions for flexibility and efficiency. But the petroleum-base fluids are flammable and this characteristic has become more critical with the rise in use.

The answer, logically, is nonflammable fluids. Until recently, however, problems have been inferior characteristics compared to the petroleum types, and also cost. But a great deal of work has been done and the results of recent field tests indicate that nonflammable fluids acceptable both as to characteristics and price will become available in increasing volume. **Their use will be another step forward in controlling the fire hazard in coal mining.**

World's Largest

U. S. coal men and manufacturers clearly established their leadership in construction and use of shovels and draglines many years ago. The record for dead weight, however, remained with the Germans and their ladder and wheel excavators. Now it appears that the U. S. is about to assume the deadweight crown with the construction of a 65-cu yd shovel weighing in at 3,250 tons. If this doesn't do it, "considerable design work has been done on a still-larger stripping shovel," for which the manufacturer in question "hopes to have a firm order shortly."

With shovels such as these, electronic miners for underground, and automatic preparation plants it is easy to note once more that an industry output of 15 tpm—or more—should be possible by 1965—and to add that coal still will not be contributing to inflation for at least that long and quite a while afterward.

In Any Walk

Recent honors for two more coal men are evidence, among other things, of the improvement in stature that coal has earned by its achievements and contributions to the national welfare. The recipients:

Raymond E. Salvati, president, Island Creek Coal Co.—West Virginia "Son of the Year," by the West Virginia Society of Washington.

W. H. Davis, formerly vice president, Mathies Coal Co., and presently assistant to the vice president of operations, Consolidation Coal Co.—"Distinguished Alumnus," Ohio State University, for outstanding technical and management achievements.

Both honors, it goes without saying, have been fully earned by men representative of the growing group in coal whose contributions would bring them equally significant recognition in any walk of life.

New Gulf Mining Lubricant H.D. meets every grease requirement

During eight months of use in a large West Virginia mine, new Gulf Mining Lubricant H.D. showed plenty of proof that Gulf makes things run better in modern mechanized mining.

The operators of the mine report a significant increase in the amount of coal mined and loaded between machine overhauls, using this new multi-purpose, semi-fluid grease.

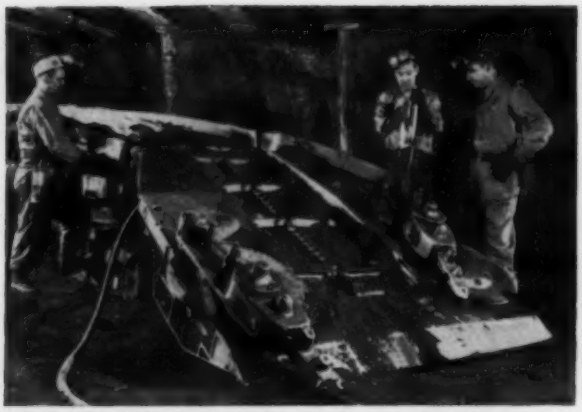
They lubricated a continuous miner, loading machine, cutting machine and shuttle cars with Gulf Mining Lubricant H.D. One grease for all their heavy-duty equipment, where previously three or four lubricants were required at the face.

In the continuous miner, Gulf Mining Lubricant H.D. was used in the bar gear cases, scroll, track rollers, conveyor, pump and conveyor-motor reducers. It protected the drives against excessive wear and stood up to severe shock loading when the machine was sumped and coal ripped from the face.

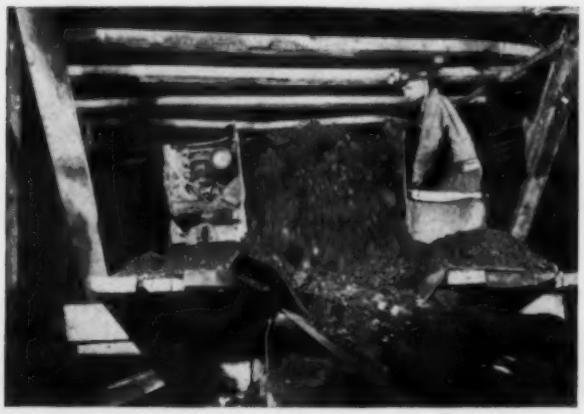
In the loading machines, and in the cutting machine, Gulf Mining Lubricant H.D. provided effective lubrication for all chassis bearings, including the gathering cases of the loading machine.

On the shuttle cars, gears and chassis bearings lubricated with Gulf Mining Lubricant H.D. included those in the traction reducers, wheel units, pump motor and conveyor reducers and universal joints.

In drive assemblies operating at high temperature,



Preventive maintenance on a loading machine. Here Gulf Mining Lubricant H.D. is applied with a pressure grease gun to a bearing in the gathering arm.



Shuttle cars keep the coal moving to the conveyor belts, with a minimum of downtime, when their gears and bearings are protected by Gulf Mining Lubricant H.D.

Continuous miners work continuously longer when lubricated with Gulf Mining Lubricant H.D.—a semi-fluid grease that withstands severe shock loads.

ups tonnage between overhauls, for underground equipment

GULF

Gulf Mining Lubricant H.D. offers the extra protection of "controlled leakage." It bleeds just enough—with a steady outward movement past the seals—to help prevent harmful coal dust and other contaminants from getting into the gear cases and bearings.

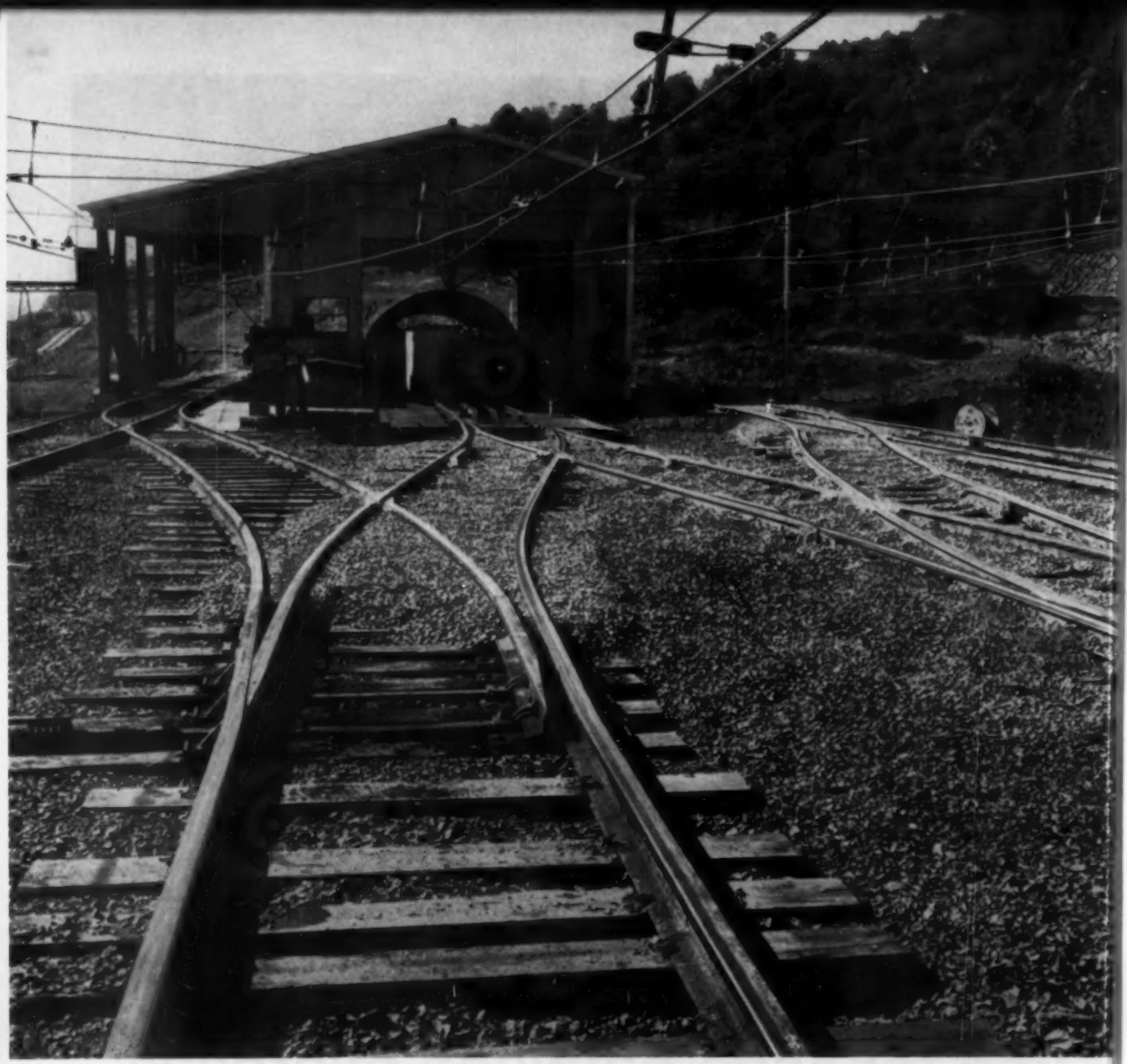
Your mine can boost tonnage and simplify the lubrication of all heavy duty equipment with new Gulf Mining Lubricant H.D. Try it. Available now in 35-lb. pails and 120-lb. drums. Call your nearest Gulf office or mail coupon for booklet.

GULF OIL CORPORATION
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.
Send booklet on Gulf Mining Lubricant H.D.

Name_____
Title_____
Company_____
Street_____
City_____ Zone____ State_____

CA 5290

GULF MAKES THINGS RUN BETTER!



Three diamond turnouts to feed the Rotary Dump

This "topside" track layout in West Virginia is a marvel of operating efficiency. It features three diamond turnouts which feed the rotary dump, and a three-way turnout at the discharge end to return the empty cars to the mine.

Ingenious layout design and well-built special trackwork were the factors that made this setup possible. Bethlehem engineers worked closely with the customer in planning and designing the layout, and Bethlehem shops prefabricated the trackwork.

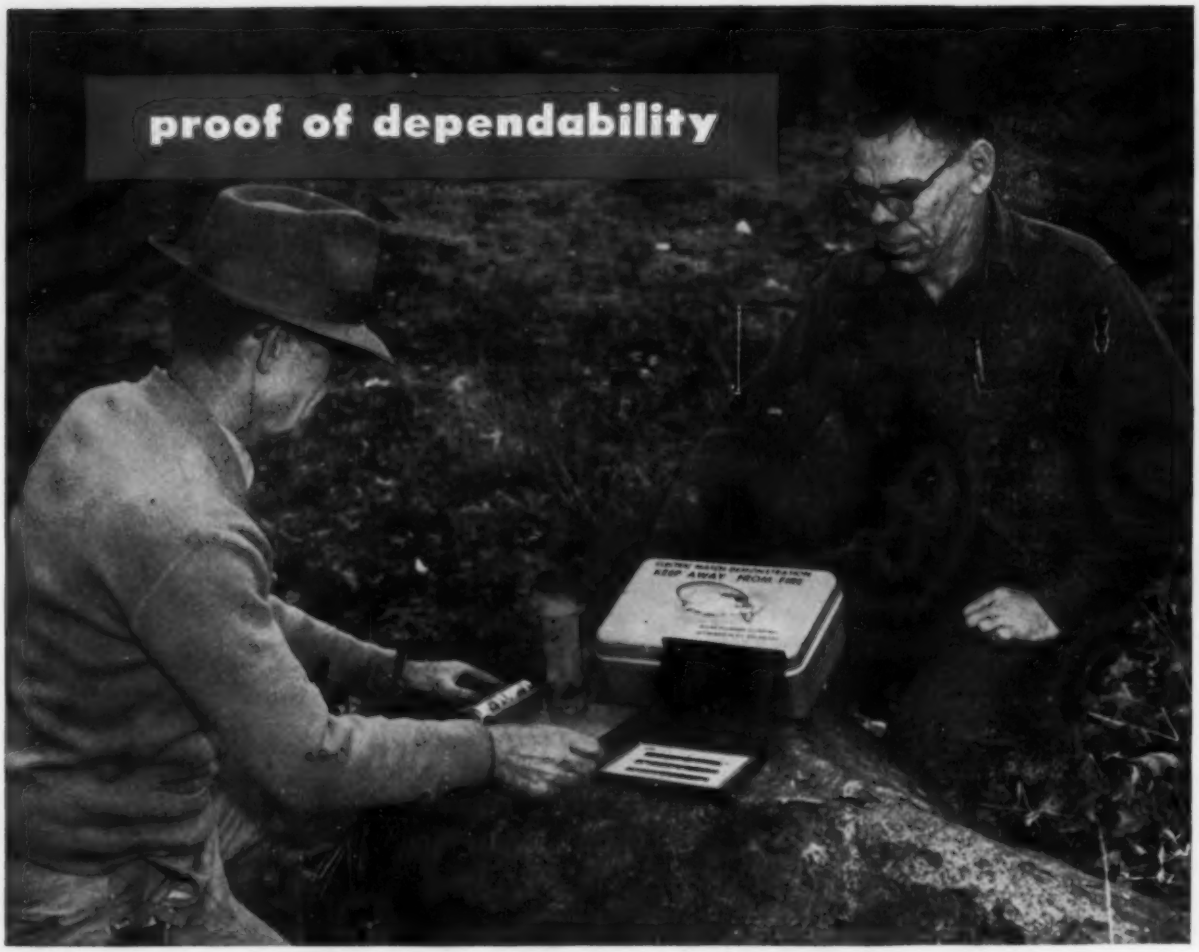
This is a fine example of Bethlehem engineering teamed with forward-looking mine management to produce money-saving results. Perhaps there is room in your haulage system for "the Bethlehem approach." Our engineers will gladly visit your workings to discuss your problems. Just put in a call to our nearest office, or drop us a line direct.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

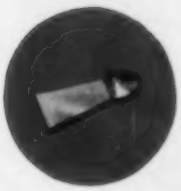
On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



See this Demonstration!



Your Atlas Representative Can Show You Actual Performance of Unique Electric Match Contained Only in Atlas E.B. Caps

All Atlas Electric Blasting Caps are fired with tiny electric matches so dependable that the armed services use thousands of them in missiles and rockets.

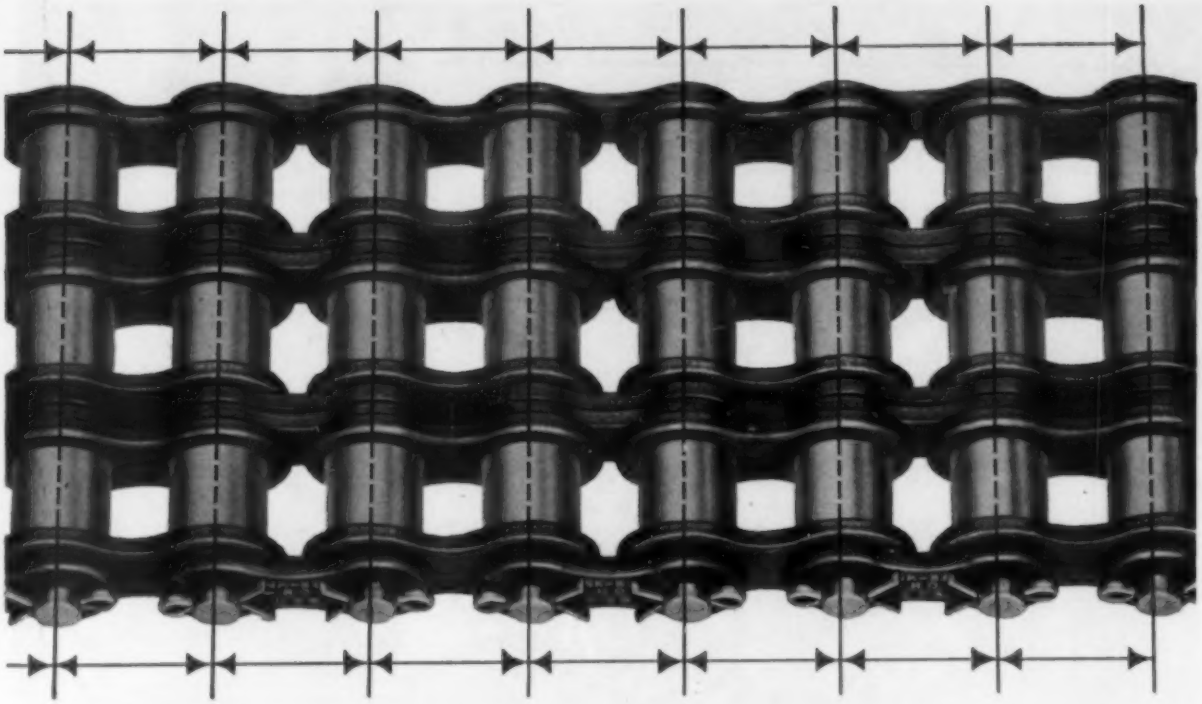
You can prove for yourself how sure-fire Atlas caps really are. Your Atlas representative has an interesting test firing kit to show you. Pick a match at random from his stock and fire it yourself . . . see how it can be depended on to fire in your blast hole.

Your Atlas man can show you *why*, too. Every part of every Atlas match is pre-tested, and the match is completed by multiple dips in high quality flash compounds.

Your Atlas representative will be glad to show you this demonstration, and to help you use Rockmaster and regular Atlas E.B. Caps for dependable initiation and timing to get effective, economical blasting.

EXPLOSIVES DIVISION
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE
Offices in principal cities

Write for your copy of the new 60-page Handbook of Electric Blasting by D. M. McFarland and Guy F. Rolland.



Equal length... equal strength

How pre-stressing ensures uniform load distribution of multiple-width LINK-BELT roller chain

Pre-stressing is one of the reasons why Link-Belt multiple-width precision steel roller chains easily handle the grueling loads common on today's drives. It seats and cold works the chain joint parts, assuring equal load distribution across the chain, minimum initial elongation, increased fatigue life.

Pre-stressing is just one of many "extras" that contribute to the *greater dynamic strength* of Link-Belt roller chain. Others include: close heat-treat control, lock-type bushings, shot-peened rollers, pitch-hole preparation. For details see Book 2657.

PRE-STRESSING MACHINE provides the pull that "sets" the parts of Link-Belt multiple-width roller chain. Besides assuring uniform load distribution, pre-stressing eliminates application difficulties on fixed center drives because the chain leaves the factory at precise operational length.

LINK-BELT

ROLLER CHAINS AND SPROCKETS

BOOK 2657 has 154 pages of roller chain data. Contact your nearest Link-Belt office or authorized stock-carrying distributor. (See CHAINS in the yellow pages of your phone book.)

15,077

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

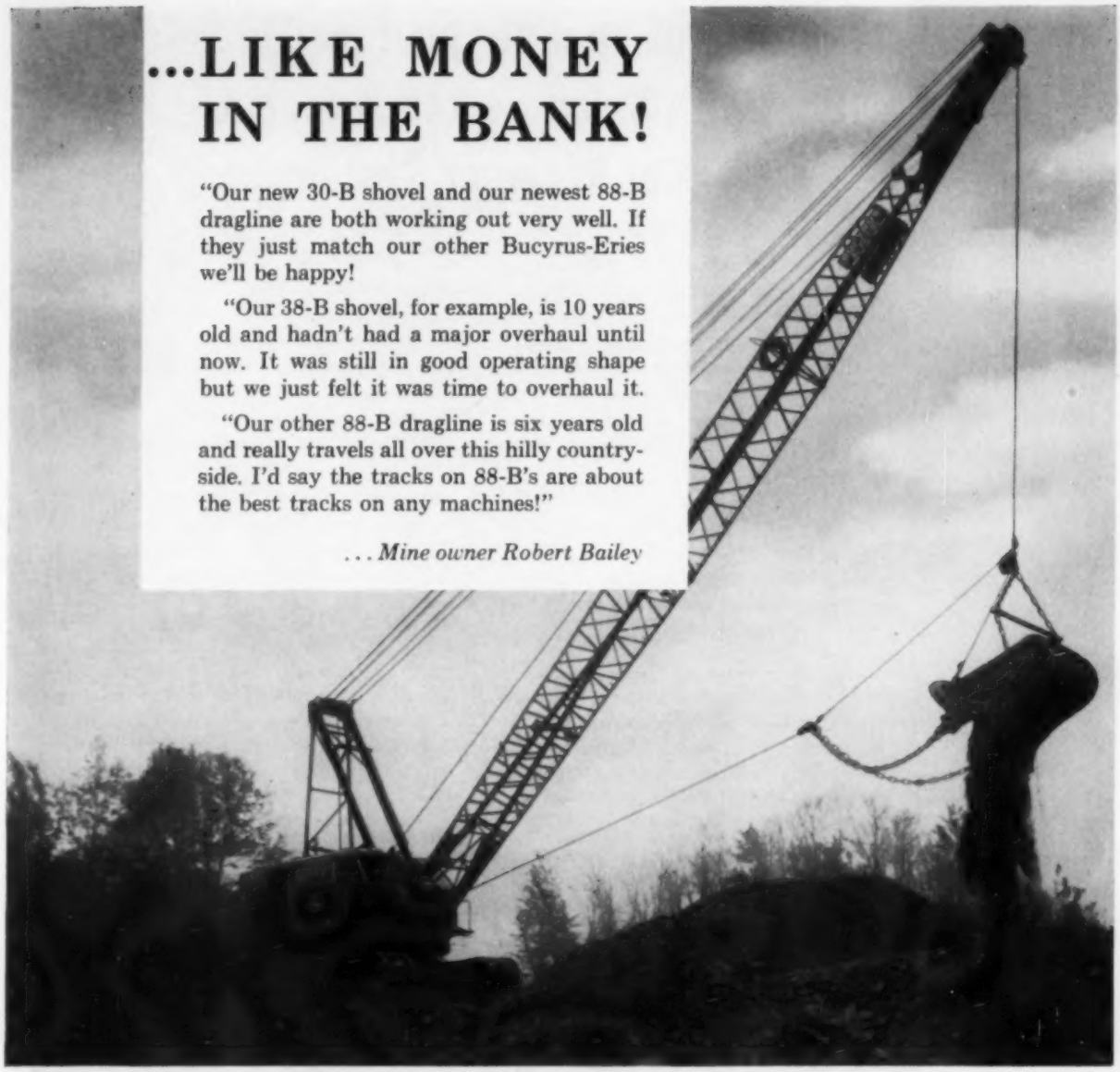
...LIKE MONEY IN THE BANK!

"Our new 30-B shovel and our newest 88-B dragline are both working out very well. If they just match our other Bucyrus-Eries we'll be happy!

"Our 38-B shovel, for example, is 10 years old and hadn't had a major overhaul until now. It was still in good operating shape but we just felt it was time to overhaul it.

"Our other 88-B dragline is six years old and really travels all over this hilly countryside. I'd say the tracks on 88-B's are about the best tracks on any machines!"

... Mine owner Robert Bailey



Robert Bailey operates three pits high up in the rolling hills around Gorton, Pa., uses Bucyrus-Erie for both stripping and loading out coal.

Why not enjoy Bucyrus-Erie top performance yourself? Your distributor will be happy to help you analyze your present equipment, show you how a new Bucyrus-Erie can help make your operations more profitable. Call him today, or write Bucyrus-Erie Company, South Milwaukee, Wisconsin, Dept. 39E.

BUCYRUS ERIE

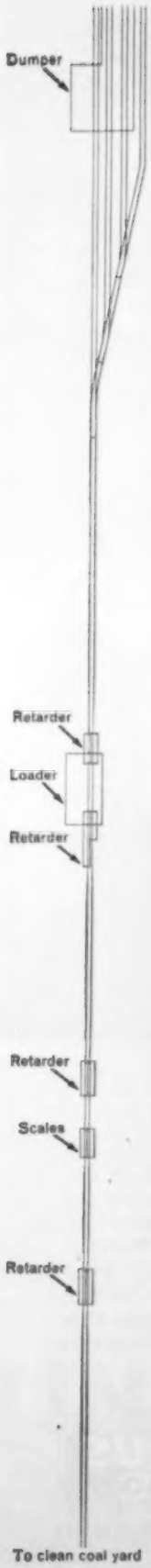
BUILDS BETTER EQUIPMENT

720 tons of coal per hour loaded safely with Union Switch & Signal Car Retarder System

At U. S. Steel's coal cleaning plant, Corbin, Kentucky, a system of four car retarders is used to direct coal cars through loading, weighing and coupling operations. This Union Switch & Signal Car Retarder System places cars with speed and accuracy, eliminates a safety hazard and results in a substantial operating saving.

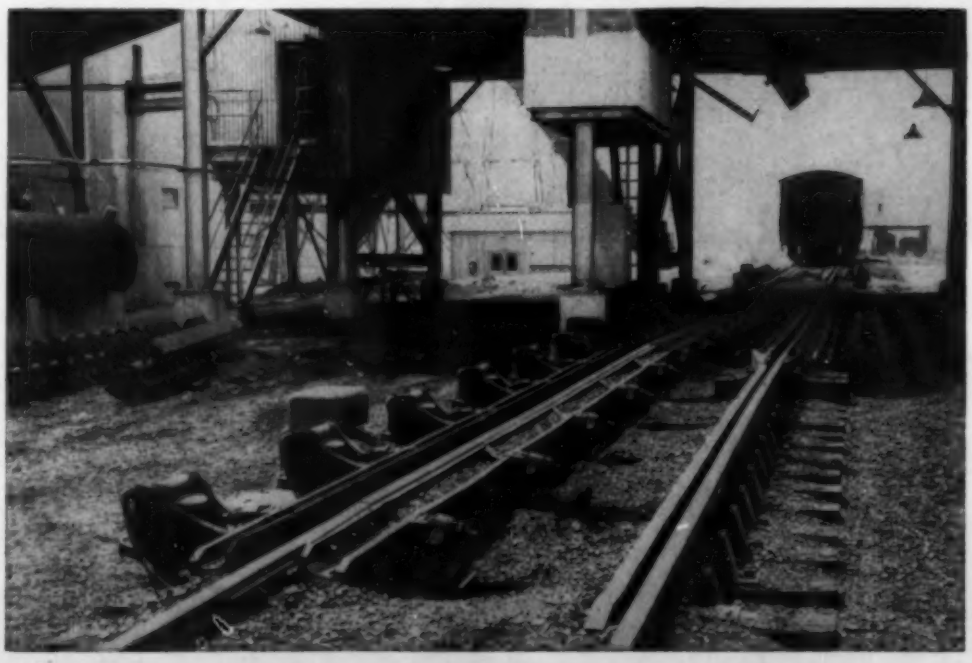
Empty cars are moved to the loading track where the pushbutton-controlled retarders take over while the cars are loaded. Cars next run by gravity to the retarders at the scale house, are weighed and then run by gravity to a collecting point at another retarder. The entire job is handled quickly and economically by two operators. In three years of operation, the system has been trouble-free and maintenance-free.

Let us help solve your car control problems. We will be happy to discuss with you—without obligation on your part—how a Union Switch & Signal Car Retarder System can speed up operations, promote efficiency, reduce safety hazards. Write today for more complete information.



The first retarder receives and controls empty cars before the loading. Under the loader the cars are slowed down by the second retarder, then move gradually to receive an even load distribution. The third retarder slows the loaded cars for accurate weighing. Just before the coupling, the cars are brought to a complete stop by the fourth retarder.

Empty cars moving to loader are controlled by first retarder, in background. This retarder arrangement provides for availability of 8 empty cars in advance of loading point. As loading progresses, second retarder, in foreground, controls movement of cars being loaded. This system of car handling moves cars with accuracy, assures a full, evenly distributed load.



UNION SWITCH & SIGNAL

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

SWISSVALE, PENNSYLVANIA

NEW YORK ..... PITTSBURGH ..... CHICAGO ..... SAN FRANCISCO

TEXACO ORGANIZED LUBRICATION CAN HELP YOU...

Keep his guns from killing your profits

His grease guns are aimed at your profits; they can help boost them – or eliminate them altogether. Here's why:

You used to need a different grease for nearly every job. That meant 20 or 30 lubricants at the mine, with the almost inevitable danger of misapplication – and damaged machinery. *Now, with the rapidly increasing mechanization of mine operations, this can be a ruinously expensive policy.*

Yet, unless you are operating on the basis of a modern lubrication survey, *the chances are that this situation still exists at your mine!*

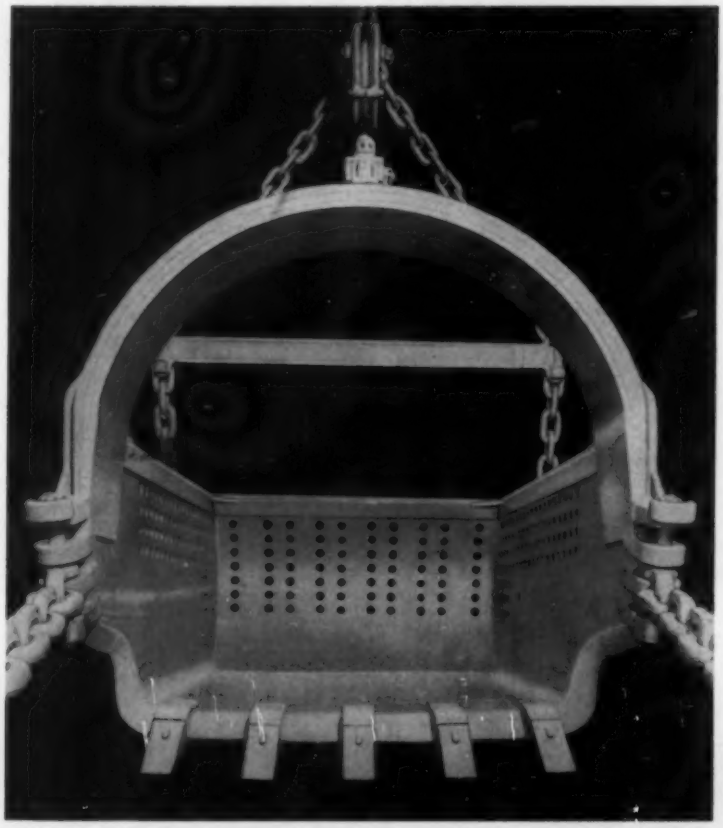
A Texaco Organized Lubrication Plan uses a minimum number of proper oils and greases – including newly developed multi-purpose lubricants – to reduce your inventory by as much as 80% and virtually eliminate this problem.

Get the details on Texaco Organized Lubrication. Contact your local Texaco Lubrication Engineer soon. He can give you an approximate dollar-and-cents prediction of the money you can save by adopting the Texaco Plan. Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

WANTED



...tough stripping situations!

"MH" HENDRIX
Heavy Duty **Mining Buckets**

- HIGHER ARCH
- GREATER WIDTH
- TAPERED BASKET
- ARCHED LIP
- GREATER STRENGTH

4½ to 14 Cubic Yards With or Without Perforations

Hendrix DRAGLINE BUCKETS

HENDRIX MANUFACTURING CO., Inc.
MANSFIELD, LOUISIANA

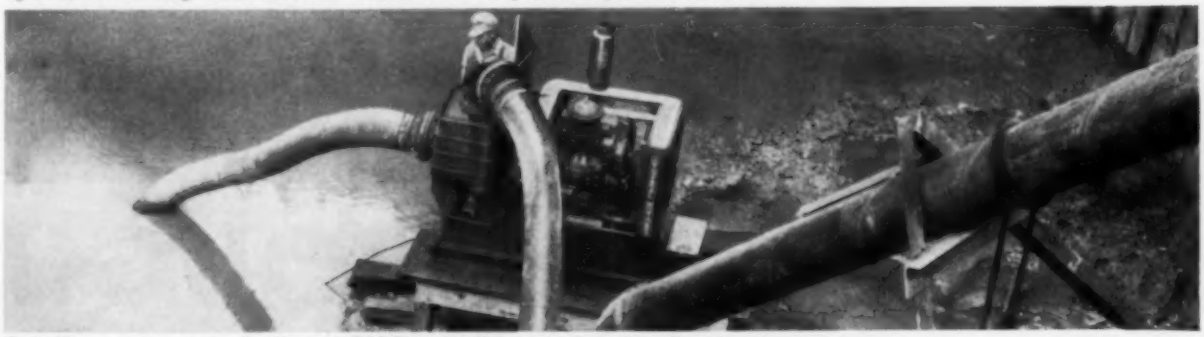
PROFIT NEWS FOR POWER USERS IN THE

all purpose power line

(20 TO 1650 H.P. IN ONLY 3 CYLINDER SIZES)

Now you can enjoy all the benefits of GM Diesel standardization in every type of equipment and still buy the best make of equipment on the market

GM Diesel engines are offered in more than 1800 applications of power equipment built by over 250 leading manufacturers—wider availability than any other Diesel



Only if a power user standardizes on GM Diesel will he get *all* the benefits of engine standardization—for *only* GM Diesel covers the entire power spectrum with only 3 cylinder sizes

Widest parts interchangeability pays off for fleet users in lower parts inventory requirements —for example, many parts for a 33 H.P. "Jimmy" Diesel fit a 1650 H.P. "Jimmy"

GM DIESEL

PARTS AND SERVICE WORLDWIDE

DETROIT DIESEL ENGINE DIVISION, GENERAL MOTORS, DETROIT 28, MICH.

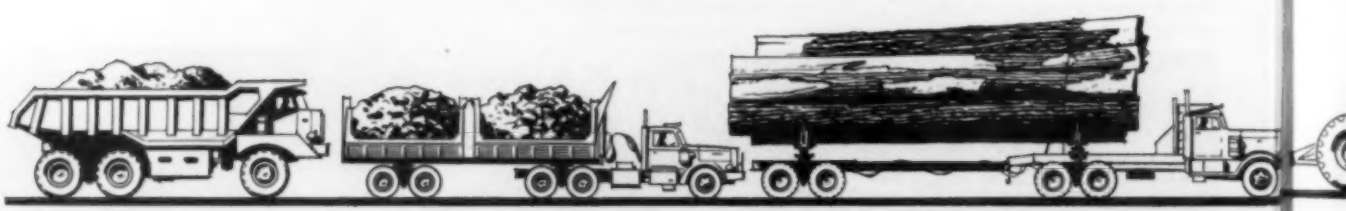
In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

NEW, RUGGED... HI CAPACITY...

5-G-1220 Heavy-Duty, 5-Speed TRANSMISSION

LONGER LIFE *with pressure filtration and lubrication*
EASIER SHIFTING *with countershaft brake*

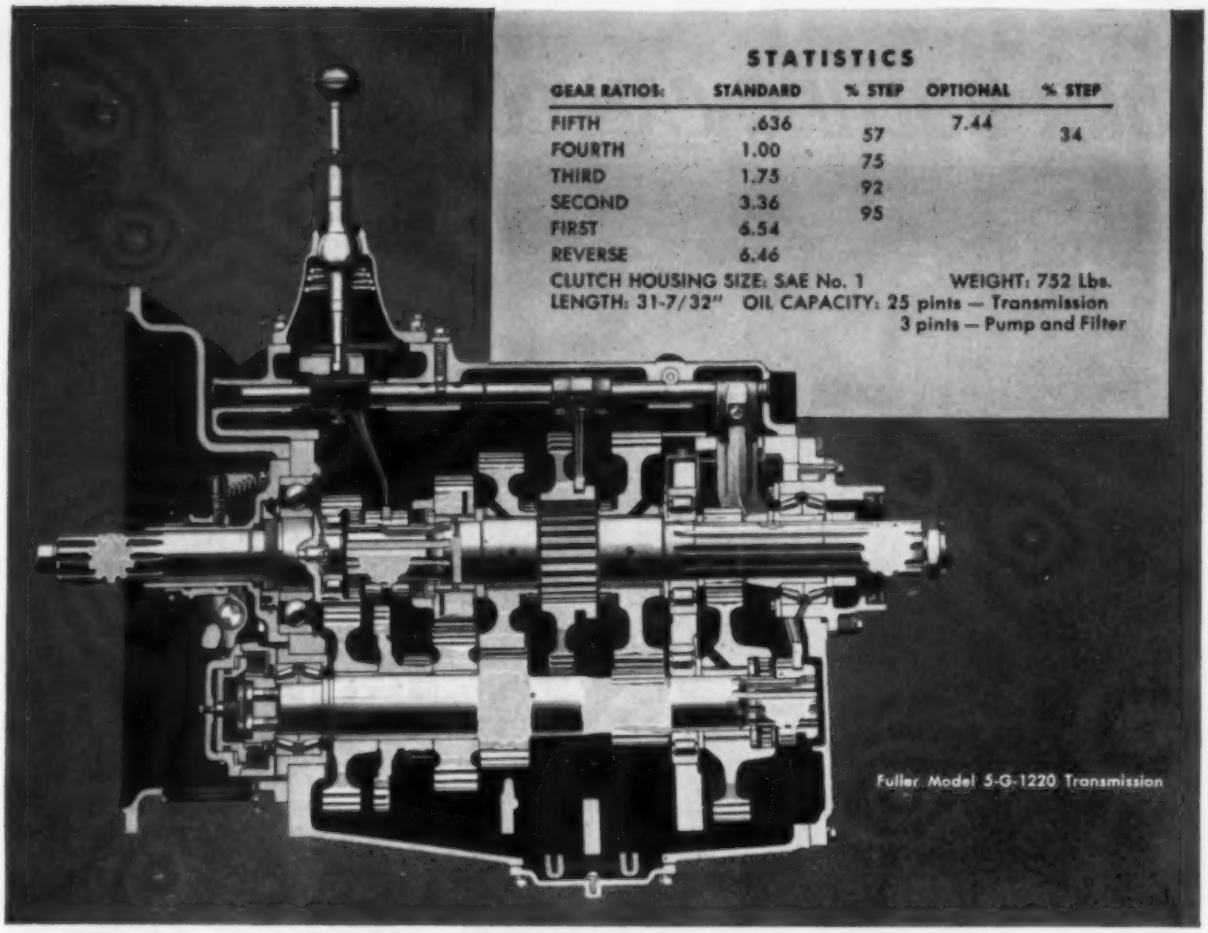
...for TOUGH



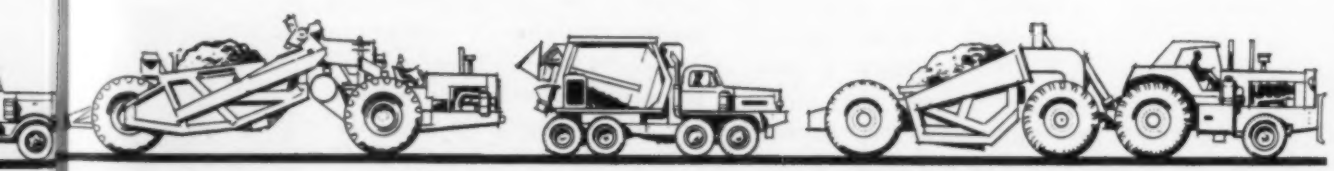
The Fuller model 5-G-1220 Transmission is engineered for heavy-duty operation in big earthmoving, logging, mining and quarrying equipment, including prime movers pulling scrapers of 12 to 14 cubic yards capacity. This new model is also designed for off-highway service in trucks equipped with engines of equivalent torque and horsepower.

Model 5-G-1220 offers higher capacity than other models in the '1220 series previously produced through elimination of axial thrust factors by the use of spur type gearing throughout the unit. As standard equipment

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.
Automotive Products Company, Ltd., Brock House, Langham Street, London W.1, England, European Representative


STATISTICS
GEAR RATIOS: STANDARD % STEP OPTIONAL % STEP
FIFTH .636 57 7.44 34
FOURTH 1.00 75
THIRD 1.75 92
SECOND 3.36 95
FIRST 6.54
REVERSE 6.46
CLUTCH HOUSING SIZE: SAE No. 1 WEIGHT: 752 Lbs.
LENGTH: 31-7/32" OIL CAPACITY: 25 pints — Transmission
3 pints — Pump and Filter
Fuller Model 5-G-1220 Transmission

off-highway service!



on the 5-G-1220, the following innovations are featured:

1. Pressure lubrication and filtration system;
2. Countershaft inertia brake.

The pressure lubrication and filtration systems provide positive lubrication of the mainshaft pilot bearing and mainshaft gear bushings, keep the gear oil clean between changes, and prolong gear and bearing life. The air powered countershaft brake, which is activated simply by pushing a button, permits quick upshifts without double clutching.

Both high production and reduced operating costs for off-highway jobs can be secured by using the 5-G-1220 Transmission. Ask your equipment dealer for further information about this unit, or write directly to the Fuller Manufacturing Company, Kalamazoo, Michigan.

FULLER TRANSMISSION DIVISION
MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN
Subsidiary EATON Manufacturing Company

YOUR BOLTING CAN COST YOU LESS!

with

LESS LABOR

LESS DOWN TIME

LESS MAINTENANCE

LESS OPERATOR FATIGUE

and MORE PRODUCTION

● ROOF BOLTING COSTS are made up of *much more* than the initial price of the machine, plus the cost of bolts and labor. Down time and lack of capacity to keep — *not just up with* — but *ahead* of the mining cycle probably rob you of more dollars than any other factor in your bolting plan. *Unfortunately, these items rarely show up directly on the cost sheet.* Instead, they steal tons of coal from your overall production — an "invisible expense" that can mean the difference between profit and loss on your whole mining operation.

● We believe the best way to make certain your bolting equipment will provide you with all the capacity you can use—*is to talk with your FLETCHER field man.* He can recommend a rugged, easy-to-maintain, high-capacity FLETCHER Roof Drill *exactly suited to your mining conditions.* With both single and dual drills available in a wide variety of heights and styles, no compromise in specifications is necessary. And mines that already have older style FLETCHER machines can modernize them at a relatively small cost to provide higher capacity with new larger volume pumps, special purpose heads, cable reels, and other attachments. For help in beating the "invisible cost" of roof bolting, call or write J. H. FLETCHER & CO. *A field engineer will be glad to talk with you at your convenience.*

Fletcher
ROOF CONTROL DRILLS

J. H. FLETCHER & CO. | P. O. Box 2143, HUNTINGTON 18, WEST VIRGINIA
JAckson 5-7811

How RYKON GREASE

has performed in five tough applications

In just two years since introduction, RYKON Grease has stepped in to deliver lubrication in hundreds of applications where other greases have failed

The reason RYKON Grease can perform under conditions that cause other greases to fail is this: RYKON Grease has a unique non-soap, organic thickener. This thickener holds the oil between its fibers better than any other gelling agent. The thickener is able to withstand extremely high as well as low temperatures. It resists chemical action and remains stable under conditions of severe working and water washing. RYKON Grease has exceptional anti-rust properties.

RYKON Grease's unique properties make it truly multi-purpose. This leads to many worthwhile economies. With one grease to do possibly every grease lubrication job in a plant, there's no chance for application mistakes. Inventory and handling of many single-purpose greases is reduced or eliminated. Maintenance training and supervisory follow-up is greatly reduced.

More facts about RYKON Grease are yours for the asking. Call the lubrication specialist in your nearby Standard Oil office in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Illinois.**

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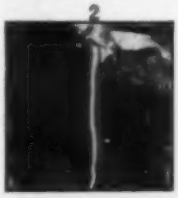

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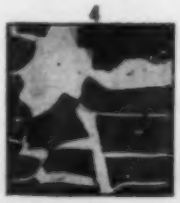


In the mining industry, where higher speeds, loads, temperatures and pressures are being put on bearings as a means of increasing productivity of equipment, a new type of grease has been needed. RYKON is that grease. Here are just 5 examples of how RYKON Grease has performed in tough spots:

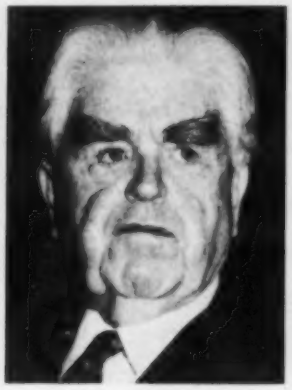
Equipment	Type of Bearings	Conditions	Remarks
Tugger hoists, gears and bearings	anti-friction	high temperature, heavy load	Very good. Holds consistency under high temperature and heavy load.
Conveyors, cars, crushers, hoists	plain and anti-friction	high temperature, heavy load, wet, dirt	Excellent water resistance. Good stability.
Shovels, draglines, etc.	plain and anti-friction	high temperature, heavy load, wet, dirt	Replaced lithium greases.
Drilling rig	plain and anti-friction	high temperature, heavy load, wet, dirt	Replaced lithium greases.
Conveyor outside tipple	anti-friction	— — — — —	Permits cold weather start-up without knocking out breakers.

You expect more from STANDARD *and you get it!*

Oven test shows high temperature performance of RYKON Grease. 1. Metal panel coated with RYKON and placed in oven at 350° F. 2. Same panel after five days. RYKON is still soft and ready to lubricate. 3. Another high-melt grease ready for same test. 4. Same panel after oven test. Grease has failed completely.

News Roundup

George H. Love



John L. Lewis

Philip Sporn

Howard E. Simpson

Wanted . . . A National Fuel Policy

Coal Policy Conference leaders join in demanding a government-coordinated fuel policy that would assure coal a fair competitive position with oil, gas and atomic energy.

A DISTINGUISHED GROUP of 550 people, including industry leaders, congressmen and government officials gathered April 27 for a dinner in the ballroom of the Statler Hilton Hotel, Washington, D. C., and heard members of the National Coal Policy Conference, sponsor of the dinner, stress the need for a balanced national policy on fuels.

The National Coal Policy Conference, organized Feb. 25, 1959, to work for the advancement of coal industry interests, is comprised of The United Mine Workers, coal producers, coal-carrying railroads, coal-equipment manufacturers and coal-burning utilities.

Among the dinner speakers, representative of those varied interests were: George H. Love, chairman of the board of Consolidation Coal Co.; John L. Lewis, president, UMW; Philip Sporn, president, American Electric Power Co.; and H. E. Simpson, president, Baltimore & Ohio R.R.

All four speakers emphasized the important role coal will play as future energy needs of this nation expand. Guests at the dinner were told that short-range policies hurting the coal industry could have the effect of permanently injuring the industry and the interests of the American people. Out of the discussion came the main proposal for a National Fuel Policy Conference, a governmental body to study the energy problems of the nation as pertaining to gas, oil, the atom and coal. Key points made by featured speakers are summarized here:

George Love, president, Consolidation Coal Co.—Mr. Love cited restrictions placed on American exports by foreign countries. These nations, in effect, underwrite their own coal industries as instruments of national policy, he said.

Contrasting this protectionist attitude of foreign nations with our own past policy, Mr. Love noted "periodic dumping" of fuels competitive with coal here during short-term periods of surpluses. "The National Coal Policy Conference," he declared, "asks for an unbiased joint congressional committee to study this whole problem and find a proper policy for balanced use of fuels, from a broad public point of view."

John L. Lewis, president, UMW—Referring to the coal industry's fine record during past wars and its achievement in boosting production per man to 11 or 12 tons per day without government subsidy, Mr. Lewis stated that more recognition would have to be given the long-neglected coal industry if it is to mobilize again to fulfill the requirements of another national emergency.

He recalled the fact that many other nations either subsidize their coal industries or have nationalized them. Saying he knew of no economic question of greater importance than this as far as the interests of the American people and the Republic are concerned, he called for Congress to write ground rules to "regulate competition among coal, oil, natural gas and atomic power in a way fair to all."

Philip Sporn, president, American Electric Power Co.—Mr. Sporn predicted a national coal requirement of 1.2 billion tons annually by the year 2,000 and an effective demand by 1975 for more than double the present output. Nuclear power will grow, he said, but will provide the equivalent of only 50 million tons of coal for electric power generation by 1975.

If coal is to fill its place in the future, Mr. Sporn stressed, it would require "a

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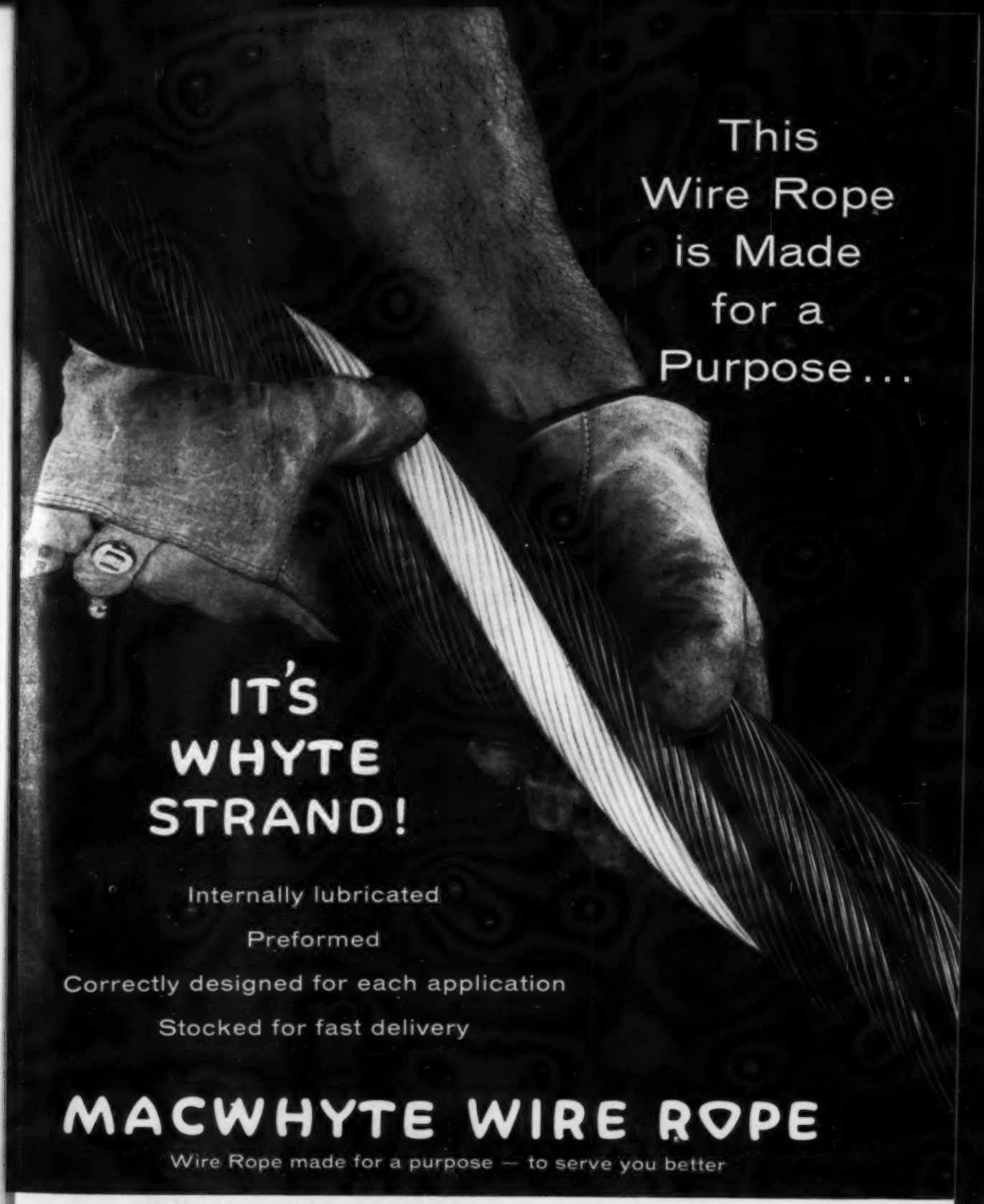

For strip shovels, loading shovels, draglines, shaft hoists, haulage, underground scrapers, loaders, mining machines, conveyors, car pullers, blast hole drills.

161

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Manufacturers of a thousand and one different wire ropes, slings, and cable assemblies
Distributed and stocked throughout the United States

reorientation of policy vis-a-vis coal and the coal industry. This requires that everyone—not just the people in the coal industry itself and even government, but major users—the utility industry, for example which has such a large stake in the continued availability of adequate and economical sources of raw energy . . . and literally everyone interested in the welfare and safety of the United States must be concerned with the present state of the coal industry's health and with finding the means to assure its vigorous survival."

H. E. Simpson, president, B&O R.R.—"Failure to evolve a well-reasoned, all-inclusive National Fuels Policy will seriously affect the ability of your railroads to serve all segments of the economy," said Mr. Simpson. He noted that the nation's railroads have available a fleet of over 500,000 hopper cars, an investment of $3 billion in equipment and facilities for the movement of coal. And on some roads, he noted, coal makes up as much as 70% of total revenue.

"It is clear that a progressive drying up of coal's share of the fuel market will seriously affect the railroad plant." Cars, locomotives and tracks dependent on coal traffic don't just stand idle until they are suddenly needed again if the carloadings improve, he commented.

In Summary—Joseph Moody, executive director of the National Coal Policy Conference, summarized the objectives of the group. He said that a national fuels policy is required which "looks at energy resources as a whole, recognizing interrelationships between various fuels, drawing on each source for its most efficient and desirable distribution. Today national legislation and government policies treat fuels in separate compartments.

"A national fuel policy refuses to countenance discriminatory competition or the stifling of further development of a competitive fuel. It promotes long term availability of a reliable energy supply at a reasonable cost by sensible policies of fuel conservation, development and distribution."

Carl J. Coash

Donald C. McGraw

Coal Age to Have New Publisher

CARL J. COASH, publisher of *Coal Age, Engineering & Mining Journal, E&MJ Metal and Mineral Markets* and *Keystone Coal Buyers Manual* since April, 1955, is leaving this capacity to become regional vice president and district manager of McGraw-Hill's Ohio District, effective August 1, 1959. He will be succeeded by **Donald C. McGraw Jr.**, recently associate publisher of *Industrial Distribution*, another McGraw-Hill publication.

Mr. Coash, a graduate of the University of Illinois in 1928, served that state as an inspector of engineering and highway construction. Joining the F. W. Dodge Corp. in 1939, he was appointed St. Louis district manager for Sweet's Catalog Div., serving for 5 yr until joining McGraw-Hill in 1944.

He held successively positions of advertising salesman for *Factory, Coal Age* and *E&MJ*, district manager for the mining publications with headquarters in Chicago and in April, 1953, moved to New York as advertising sales manager of these publications, holding the latter position until his appointment as publisher.

Mr. McGraw attended the College of William & Mary and Carnegie Institute of Technology and served on active duty in the United States Naval Reserve for 4 yr. He joined the McGraw-Hill Publishing Co. in August, 1950, after having been associated with the G. M. Basford Co., advertising agency, and the *Flower Grower* magazine as an advertising representative.

With McGraw-Hill he has been an advertising salesman on *Product Engineering* in the Atlantic District. He later became association manager of the Eastern District, assistant director of advertising sales and advertising sales manager of the mining publications.

Coal Chemicals

Directors of the Philadelphia & Reading Corp. and the General Dynamics Corp. announced May 11 they had agreed in principle to set up a jointly-owned corporation to produce chemicals from anthracite mining wastes and residue products.

Howard A. Newman, president of Philadelphia & Reading, indicated that the "magnitude of the venture would be in excess of $100 million," but also expressed the belief that his firm would not be obligated to any financing other than its part of the equity financing.

The new firm would be called Dynamics-Reading Chemicals, Inc., and would be the only chemical company in this country recovering chemicals from this type of mining waste, according to the announcement.

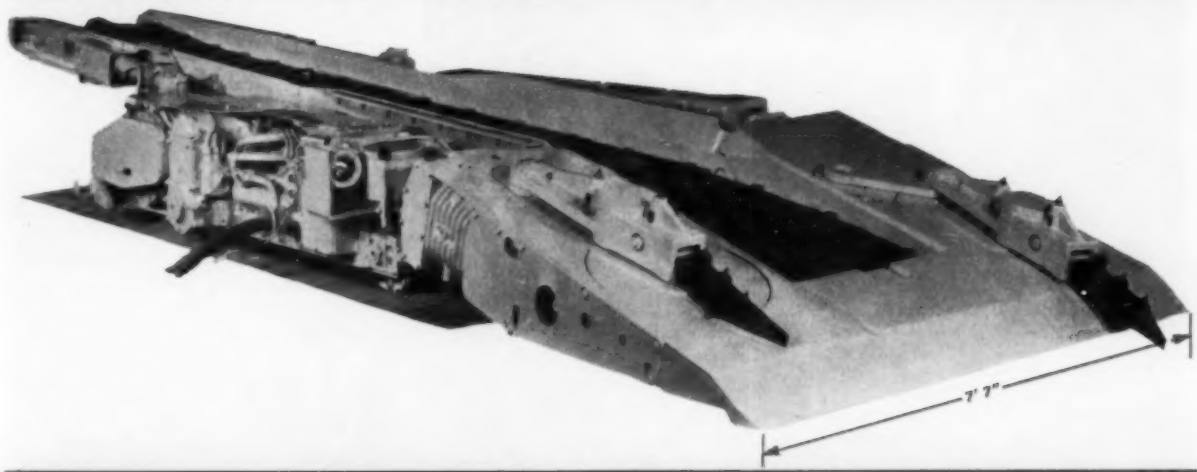
The new corporation would produce hydrogen, ammonia, ammonium nitrate, urea, nitrogen solutions, methanol, calcium carbide, acetylene and vinyl chloride, these going primarily for bulk sales to the chemical industry and allied industries.

Manufacturing operations would utilize the so-called Lurgi process employed in Germany for several years. Philadelphia & Reading, a holding and management firm with subsidiaries producing anthracite, cinder building blocks, boots and clothing, owns large reserves of anthracite wastes near Pottsville, Pa. General Dynamics makes aircraft, missiles, submarines, electronic equipment and is active in nuclear research.

Honored With Safety Award

At a safety banquet held April 14 in Pittsburg, Kan., employees of the Pitts-

Rated at 14 to 16 tons per minute in low coal



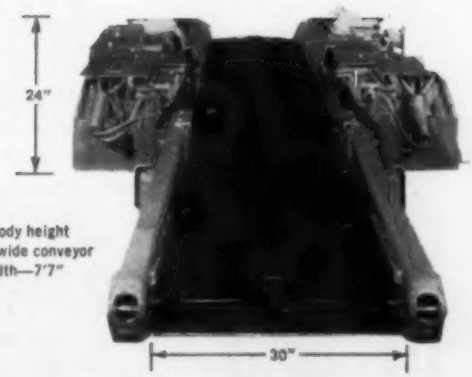
new Goodman 964 loader

With a *low* body height of only 24" and a 15½" coal line height, this newest Goodman Loader makes working the lowest veins profitable. *A wide 30" conveyor* combined with a 7'7" clean-up width and 55 or 64 gathering arm strokes per minute—offers a rated capacity of 14 to 16 tons per minute.

And you have power to spare with four 20 hp, permissible type, high continuous capacity motors (for AC or DC operation). Two are for loading, two for tramming and hydraulics. All are identical and interchangeable.

Construction throughout is rugged for heavy service . . . yet handling, even in close quarters, is smooth and easy. 12" wide treads provide for free movement on any kind of bottom.

Make your coal operation pay off. Team the high capacity of the 964 with the big car performance of the new Goodman 870-20 low vein shuttle car. Your Goodman sales engineer can give you the full story.



Low—24" body height
Wide—30" wide conveyor
Clean-up width—7'7"

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CUTTING MACHINES • CONVEYORS • LOADERS
SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

CERTIFICATE OF COMMENDATION is awarded to Emil Sandeen (left), mine superintendent, No. 19 mine, Pittsburg & Midway Coal Mining Co., by R. D. Bradford, sub-district supervisor, health and safety, District G, U.S. Bureau of Mines, McAlester, Oklahoma.

burg & Midway Coal Mining Co., Mine No. 19, were honored for having worked a full calendar year without a disabling injury.

A certificate of commendation from the National Safety Council was presented by R. D. Bradford, sub-district supervisor, District G of the Bureau of Mines. Mr. John Sponske, safety engineer, Bituminous Casualty Corp., presented an award to the mining firm from his insurance company.

In addition to company employees and officers the following guests were present: John Delplace, chief mine inspector, Kan.; John Cartwright, deputy mine inspector, Kan.; and W. C. Bray, branch manager, Bituminous Casualty Corp.

Sells Coal Docks

North American Coal Co. announced April 30 that it had sold its coal dock properties to The C. Reiss Coal Co.

The sale includes a coal dock at Duluth, Minn., operated by North American's Inland Coal & Dock Div. and three docks and a coal briquet plant at Milwaukee, Wis., operated by North American's United Coal & Dock Div.

Henry G. Schmidt, president of North American, commented that the sale of his company's docks represents a progressive move on the part of North American because the transaction provides for a long-term contract for the sale of North American coals to Reiss. "The future of our company lies in the mining and marketing of our own coal rather than with dock operations, and we look upon the sale of our docks, to what we consider the leading coal dock company in the Northwest, as a forward step," he said.

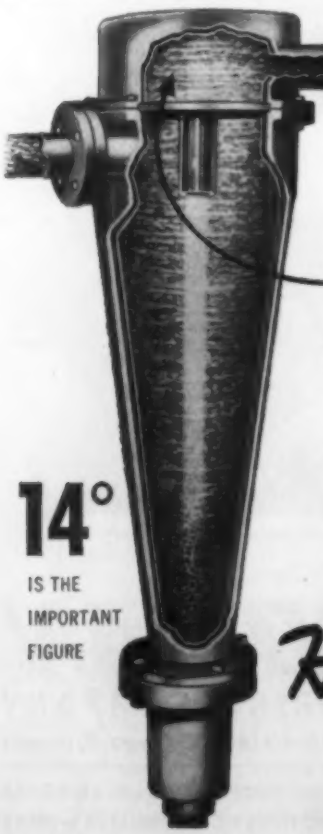
William A. Reiss Jr., Reiss Coal Co. president, said the move constitutes a logical expansion for his firm inasmuch as it has not previously operated in Duluth or Milwaukee so that it will now be in a position to reach new markets.

Coal For Roads

Curtiss-Wright Corp. has developed a new blacktop road-paving material fortified with coal, which it believes may open a major new market for the coal industry, and has suggested a joint program with Commonwealth of Pennsylvania for further development and testing of the product.

The company wants to construct several stretches of highway in Pennsylvania with the binder material which is said to have greater resistance to weight, heat and other forces than conventional materials. The new-type roads, say the firm, will also have a high coefficient of fric-

(*Continued on p 63*)



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THE OVERFLOW CHAMBER of the H & P Cyclone protects your installation against abrasive effects of a turbulent overflow and prevents back-pressure, suction and other adverse effects of a directly connected piping system.

This is one more reason why all H & P Cyclones process more gallons at low pressure with high efficiency—at lowest overall cost.

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Heyl & Patterson INC.

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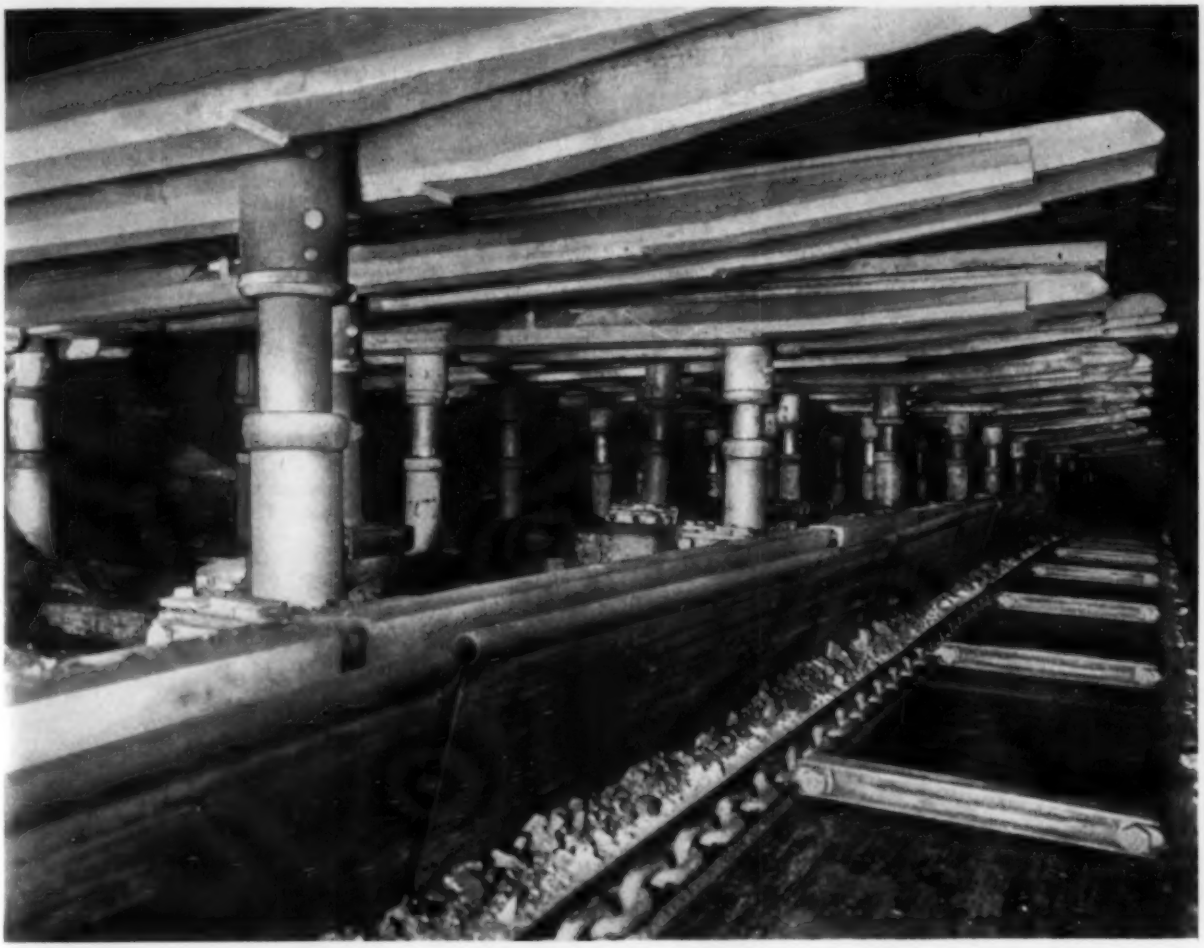

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gives automatic roof support

Labor saving
Only two men on roof control for a 600-ft. face.

Finger-tip control
Advances automatically under hydraulic power.

Maximum safety
Gives immediate support behind the cutting machine.

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People in Coal

Heads AMC Coal Division

JESSE F. CORE, vice president of operations for the Coal Div. of United States Steel Corp., was recently named to the chairmanship of the American Mining Congress Coal Div., Raymond Salvati, president, AMC, announced. The new chairman succeeds L. C. Campbell, retired vice president of Eastern Gas & Fuel Associates.

Hailing from Ford City, Pa., Mr. Core studied at Penn State University, graduating with a degree in mining engineering. Since then he has followed a course heavily paved with experience in the coal mining industry.

Before coming to U. S. Steel he worked for four leading coal companies in various capacities, the first of which was as a miner with Hillman Coal & Coke in 1935.

In 1938 he joined Pittsburgh Consolidation Coal Co., being employed in a variety of jobs until 1947 when he became chief engineer at Nemacolin mine for the Buckeye Coal Co. He later served in the same capacity for Island Creek Coal Co. at Holden, W. Va., from 1950 to 1951.

Soon after coming to U. S. Steel's Frick District as mining engineer, he moved up to chief engineer for the District in 1954. In 1955 he again rose higher to general superintendent and in February, 1958, was appointed vice president-operations, Coal Div., for the organization.

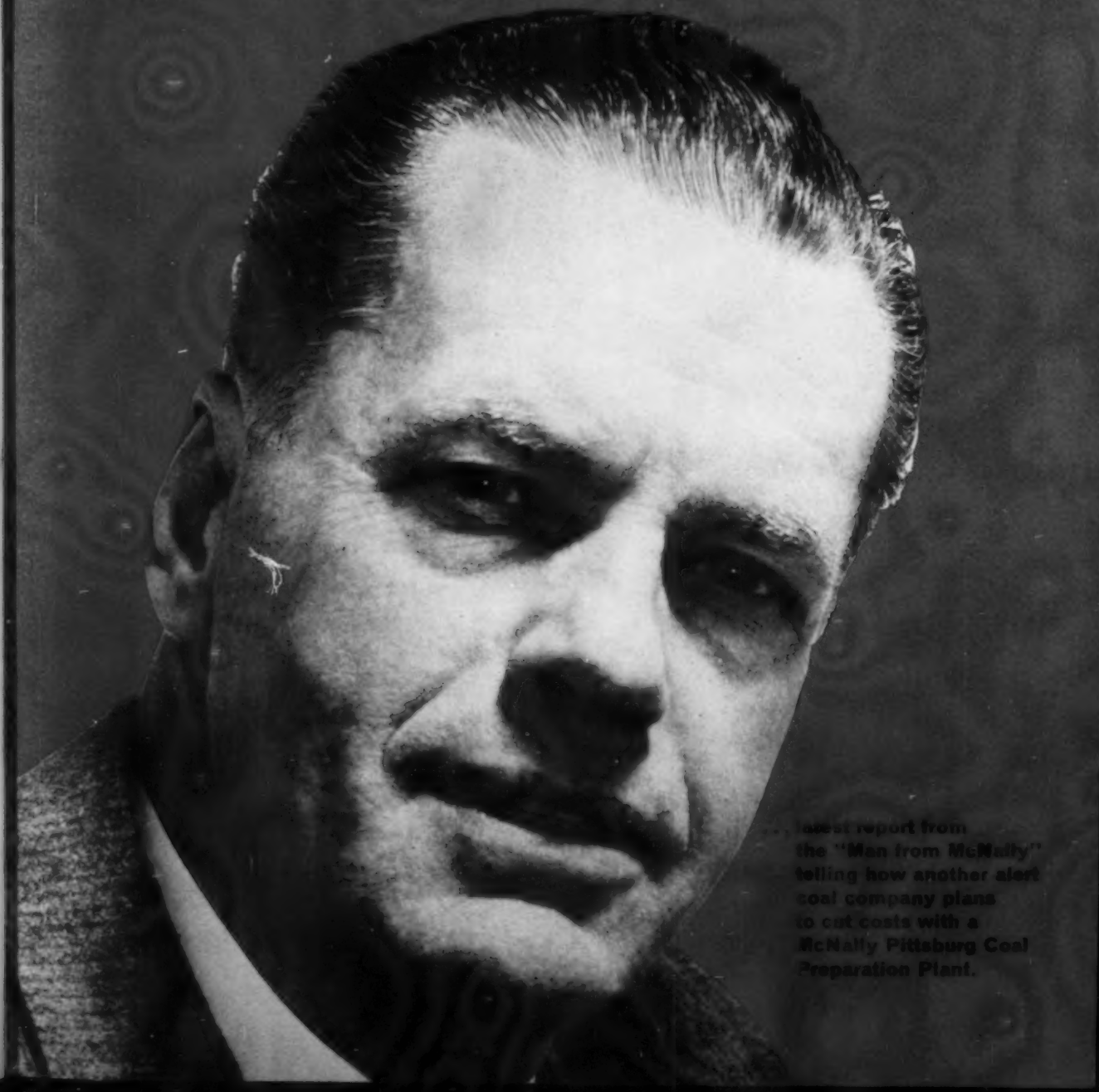
J. A. Boyle has been appointed director, mine inspection, for the Coal Div. of U. S. Steel, succeeding George H. Sambrook. Mr. Boyle was born in West Overton, Pa., and began his employment with the company in 1916 as an assistant machinist at the Frick District's Everson shop. He joined the firm's American Sheet & Tin Plate Co. in 1919 and in 1927 became foreman at the District's Lambert mine. In 1942 he was promoted to assistant mine inspector and 2 yr later became chief mine inspector, the position he held prior to his recent appointment. Mr. and Mrs. Boyle, who reside in Uniontown, Pa., are planning to move to Pittsburgh shortly. Mr. Boyle is a member of the National Safety Council, Mine Inspectors Institute, Coal Mine Safety Exchange Group and the Coal Mining Institute of America.

George H. Sambrook, director, mine inspection, for U. S. Steel's Coal Div., has retired after more than 39 yr of service. Mr. Sambrook, a native of Livingston, Ky., attended the University of Louisville. He began work as a payroll clerk with U. S. Coal & Coke Co., a U. S. Steel subsidiary, in 1920 He then held positions of assistant mine foreman, foreman and chief mine inspector at the division's Lynch, Ky., district. In 1941 he moved to H. C. Frick Coke Co. as assistant safety director, later becoming safety director. When H. C. Frick Coke merged with U. S. Steel in 1951, Mr. Sambrook was named director, mine inspection. He is active in the Mine Inspectors Institute as well as National Safety Council, for which he served as program chairman, Coal Mining Section, in 1958.

Wayne D. Snell moves up to chief mine inspector for the U. S. Steel Frick District, succeeding J. A. Boyle. A native of Uniontown, Pa., Mr. Snell studied engineering at Carnegie Institute of Technology. He began work with U. S. Steel in 1923 as a laborer at the Frick District's Continental mine. During the following years, he held positions of fire boss, assistant mine foreman and mine foreman. He became assistant director, mine inspection, for the Coal Div. in 1948, holding this position until his recent appointment. Mr. Snell is a member of the Coal Mining Institute of America, Mine Inspectors Institute of America and AIME. Residing in Pittsburgh, he and his wife will move back to Uniontown shortly.

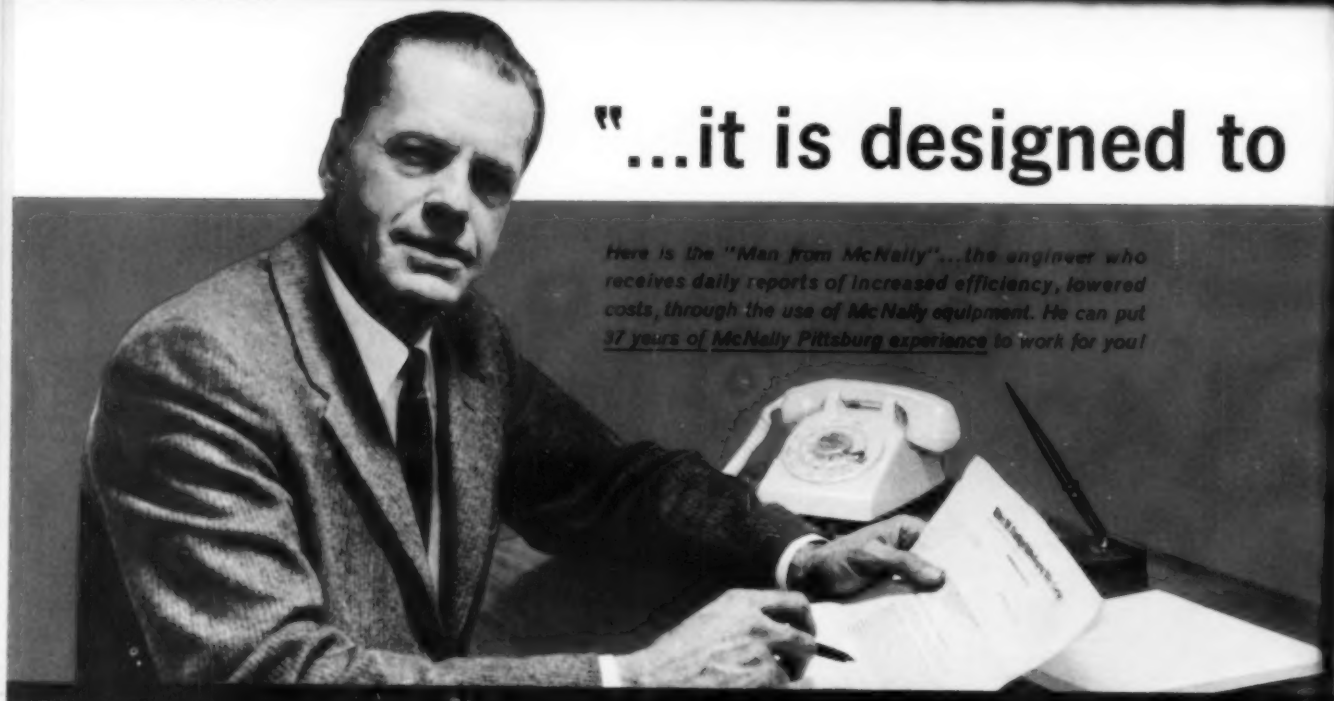
(Continued on p 38)

"This new McNally plant means greater efficiency than ever before..."



...latest report from the "Man from McNally" telling how another alert coal company plans to cut costs with a McNally Pittsburg Coal Preparation Plant.

"...it is designed to



Here is the "Man from McNally"...the engineer who receives daily reports of increased efficiency, lowered costs, through the use of McNally equipment. He can put 37 years of McNally Pittsburg experience to work for you!

slash costs, improve profits"

Another major McNally midwest producer, this new Thunderbird Preparation Plant has been designed—from the very first blueprint—to deliver increased tonnage with maximum efficiency, lower operating and maintenance costs.

Its high capacity McNally Giant Washer will handle up to 750 tph of 4" x 0" directed from the rotary breaker or from the 1000-ton storage bin.

The washer is equipped with a middlings crushing circuit, reducing the middlings to 1¼" x 0" for rewashing.

The 1¼" x 0" washed coal is loaded on cars on either of two railroad tracks through a 600-foot traveling belt tripper. The loading-out belt conveyor is equipped with a belt-type sampler.

The ⅜" x 0" coal is recovered from the settling tank and delivers to two centrifugal dryers. After the moisture is removed, the coal is combined with the washed coal and delivered to the track belt.

Another McNally exclusive—used for the *first* time in this plant—*automatic loading of 28 cars without attendant!* This new system uses a belt conveyor, motorized belt tripper, photoelectric devices, and complete push-button controls to load up to 14 cars on two separate tracks—automatically. A new concept in automation, it is one more reason why more companies look to McNally Pittsburg for cost-cutting efficiency in coal handling equipment.

Thunderbird Collieries Corporation Plant, Sullivan, Indiana

Mail the coupon today

...for full information on any or all of the McNally equipment listed.

ASK THE MEN WHO KNOW COAL FROM THE GROUND UP

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MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

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Please send me information about the following equipment:

- ☐ Complete Coal Preparation Plants
- ☐ Heavy-duty Equipment ☐ Coal Cleaning
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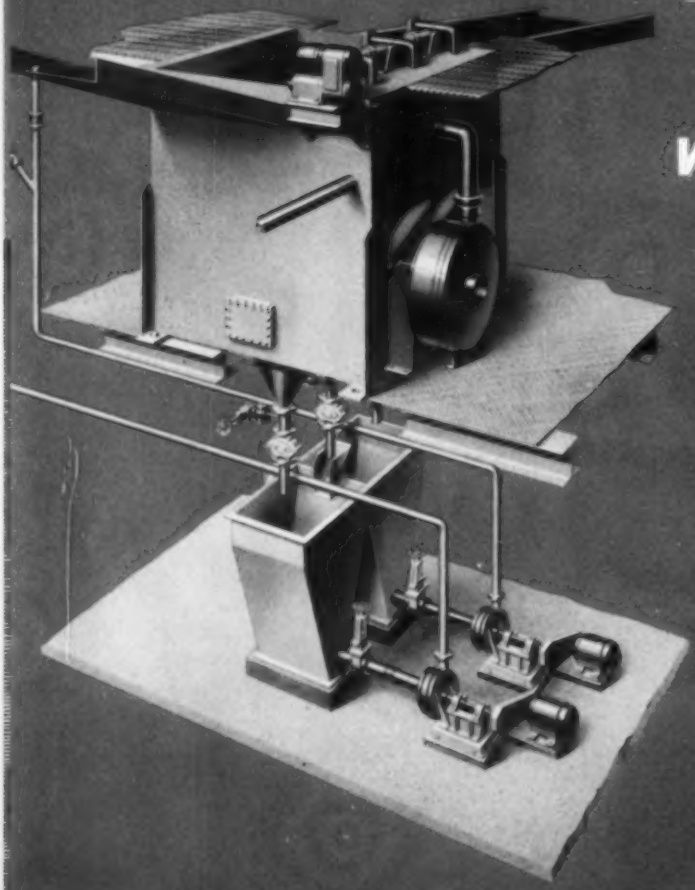
CITY _____ STATE _____

Discover hidden profits with the
McNALLY AUTOMATIC FINE COAL WASHER



FELDSPAR JIGGING WITH POSITIVE AUTOMATIC CONTROL

This new type McNally Automatic Coal Washer handles up to 100 tons per hour of fine coal, yet occupies about 75% less space than convontional washers. It offers maximum cleaning efficiency and compactness by the use of the Baum principle combined with a feldspar bed. New design of the impulse valves permits positive automatic control without an operator. Reject material leaves each washer cell individually, allowing one or more cells to be used for middlings recirculation, if required.

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WITH LUKENS "T-1" STEEL

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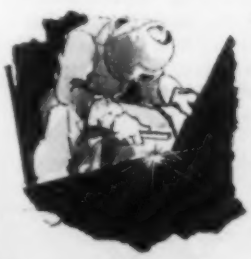

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LUKENS

People in Coal (*Continued*)

The Dept. of the Interior has awarded its highest honors for outstanding Federal service to two administrators of the Bureau of Mines and to a Bureau research scientist who died recently. The Distinguished Service Award and gold medal were bestowed on Bureau of Mines director **Marling J. Ankeny,** and **Earle P. Shoub,** regional director of the Bureau's Region V. Honors were posthumously given to **Dr. Irving Hartman,** who until his death last February, was chief of the Branch of Dust Explosions at the Bureau's research center. Employed steadily by the Bureau since 1928, Mr. Ankeny was cited for dedication to duty and "exceptional skill in maintaining the confidence and support of both management and labor." Mr. Shoub, with the Bureau since 1943, developed a process for making high-quality sponge iron in rotary kilns and introduced the successful use of iron-oxide catalyst for speeding the gasification process used to convert coal to oil in the Bureau's research program. Dr. Hartmann was credited with helping to prevent explosions and loss of lives through work on safety procedures and devices.

Joseph M. Hovanic has been named a new Pennsylvania state mine inspector. Mr. Hovanic started in the mines at Brier Hill mine 25 yr ago and has done various jobs as brakeman, coal loader, bratticeman, fire-boss and assistant mine foreman, and had been foreman for Jones & Laughlin Vesta No. 5 for 15 yr.

Raymond E. Salvati, president of Island Creek Coal Co., has been named "West Virginia Son of the Year" by the West Virginia Society. The group also picked **John L. Lewis,** president of the United Mines Workers, as an "Adopted Son."

Quin Morton III has been appointed executive secretary of the Kanawha Coal Operators Association. Mr. Morton has been active in the coal industry since 1931 and was formerly associated with Robinson and Robinson, engineering firm, and the Kimberling Collieries Co.

D. H. Lewis has been named vice president of Garland Coal Co. Mr. Lewis was formerly vice president-sales, for Jewell Ridge Coal Sales Co. His headquarters with Garland will be Cleveland.

Robert M. McCarthy, controller, Consolidation Coal Co., has been elected to membership in the Controllers Institute of America. The Institute is a non-profit management organization of controllers and finance officers from all lines of business.

Edwin R. Price was confirmed by the Senate to serve another term as a member of the Federal Coal Mine Safety Board of Review.

BELT FAILURES?

Switch to

NEW YORK RUBBER!

New York Rubber, famous since 1851, manufactures belt designed to meet trouble—and overcome it! Built for the most severe service demands, there's a New York Rubber belt designed to solve *your* problem. Mineral mining, quarrying, coal mining—these activities often require a belt that will show superior resistance to sharp and abrasive materials, frequently in the presence of oil and grease conditions. Fire, too, takes its toll of conventional belts.

That's why it will pay you to investigate New York Rubber. A brief description of four of our most popular belts follows. Write on your letterhead for more complete details on these and other superior New York Rubber Belts.

REDUCE FAILURES

with these New York Rubber belts:

STONORE—Highest quality, for most severe service. Handles heavy ores, trap rock, crushed stone, coarse broken glass, slag, cement clinkers, direct feed from digging and mining machinery. Mildew-proof.

DEPENDABLE—For handling coal both under and above ground, sand and gravel, trap rock, sulphur, lime and limestone. Ideal for sub-zero temperatures. Mildew-proof.

NEOPRENE—Resists oil and grease conditions adverse to natural rubber. Handles caustics and coal briquettes. Heat-resistant to 250°F. Mildew-proof.

TEMP-PRENE*—A neoprene compounded for fire resistance and severe, rough surfaces. Mildew-proof.

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Rear-Dump "Eucs" have payload capacities of 10 to 50 tons—are powered by engines of 128 to 670 total h.p. . . . have loaded speeds up to 41 mph.

For Lower Hauling Costs in Mines and Quarries Check Euclid Performance

Open pit mine and quarries the world over have standardized on Euclid equipment for moving earth, rock, coal and ore on tough off-the-highway hauls. They know from years of experience on their own operations that "Eucs" get more work done every shift—that production cost is lower than with other types and makes of equipment.

Euclid has a complete range of sizes and models to fit every job requirement — rear dump and bottom dump haulers, self-powered scrapers and the world's most powerful crawler tractor. Your Euclid dealer will be glad to provide a production-cost estimate on your present or planned operations — be sure to see him before you replace or add to your equipment fleet — and have him show you why Euclids are your best investment.

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Bottom-Dumps carry 13, 17 and 25 cu. yds. struck . . . special coal hauler trailers have capacities of 25, 40 and 51 tons. Full length, unobstructed door opening make these "Eucs" ideal for dumping free-flowing material into drive-over hoppers.

The TC-12 Crawler has 2 engines and independent track drive . . . 402 net h.p. . . . full power shift . . . top speed of 7.8 mph. This "Euc" tractor has unequalled work-ability for heavy dozing, ripping and similar work in mines and quarries.

This "Twin" Scraper has 2 engines with Torqmatic Drive . . . all wheel drive permits self-loading . . . struck capacity is 24 cu. yds. There are six other Euclid Scrapers, overhung engine and six wheel types, with struck capacities ranging from 7 to 24 yds.—9 to 32 yds. heaped.

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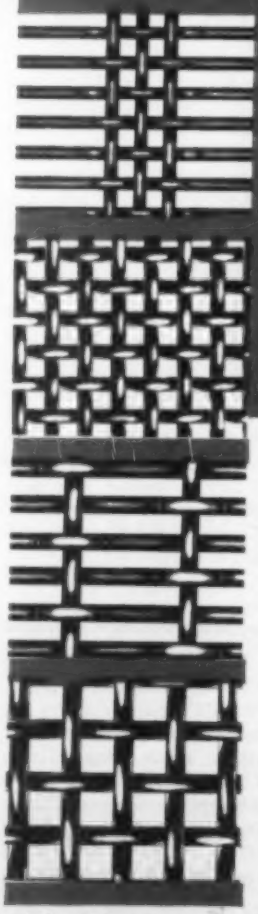
FOR MOVING EARTH, ROCK, COAL AND ORE



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SPACE SCREENS

SAVE UP TO HALF ON SCREENS!
In addition to top re-resistance to wear, fatigue and distortion, Ludlow-Saylor Screens are engineered and precision-made to give you these vital assists to higher profits:

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- $ Replacement screen costs, downtime and maintenance are drastically reduced.

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They cost no more but last up to twice as long.

Immediate Shipment of most weaves and sizes.

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Ludlow-Saylor Screens and Wire Cloth can be supplied in any steel including SUPER-LOY high carbon, LUDLOY oil-tempered, stainless and other alloys; Monel, bronze, copper, brass or any metal that can be woven into wire.

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SALES OFFICES: BIRMINGHAM, 1727—6th Ave. N. • CHICAGO, 6261 W. Grand Ave. • PITTSBURGH, Union Trust Bldg. • HOUSTON, 5638 Harvey Wilson Drive • DENVER, 1530 Carr St. • LOS ANGELES, Star Wire Screen & Iron Works, Inc. (Ludlow-Saylor Subsidiary), 2515 San Fernando Road.

Equipment Approvals

Fourteen approvals were issued during April.

The Long Co.—Type LRB-2 roof bolter; two motors, each 5 hp, 230 V, DC. Approval No. 2F-1456, April 2.

Wilson-Snyder Works—Type ES-JOB-8J-9756 mining pump; one motor, 25 hp, 250 V, DC. Approval No. 2F-1457, April 6.

The Jeffrey Mfg. Co.—Type ML81C crawler loader; four motors, each 15 hp, 250 V, DC. Approval No. 2F-1458, April 7.

The Long Co.—Type LDRB-2 roof bolter and drill; three motors, each 5 hp, 230 V, DC. Approval No. 2F-1459, April 8.

Joy Mfg. Co.—Type 7CM-1E continuous mining machine; seven motors, two 100 hp, four 15 hp and one 4 hp, 250 V, DC. Approval No. 2F-1460, April 10.

Compton, Inc.—Type CU32 underground auger; two motors, one 75 hp and one 15 hp, 250 V, DC. Approval No. 2F-1461, April 13.

Schroeder Bros. Corp.—Type T2-SP-2 hydraulic power unit; one motor, 7½ hp, 440 V, AC. Approval No. 2F-1462A, April 14.

Goodman Mfg. Co.—Type 984-B tractor tread loader; four motors, each 20 hp, 250 V, DC. Approval No. 24-1463, April 15.

Thomas A. Edison Industries—Type "S" Edison electric cap lamp with a Model P headpiece and Model RF battery. Approval No. 6D-31, April 16.

Mine Safety Appliance Co.—Mine rescue communication system; battery-operated transistorized telephone for use with breathing apparatus. Approval No. 9B-906, April 16.

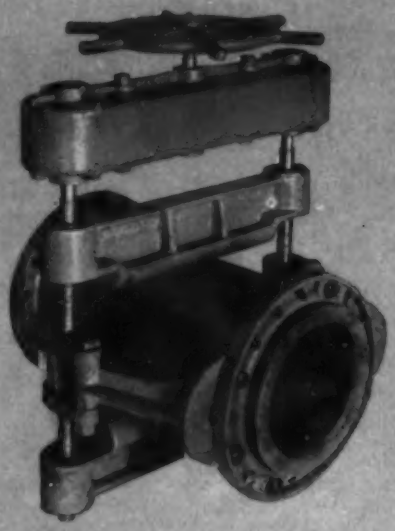
Joy Mfg. Co.—Type RBM1-1E continuous mining machine; five motors, two 50 hp, one 40 hp and two 10 hp, 250 V, DC. Approval No. 2F-1464, April 23.

Joy Mfg. Co.—Type 2BT-2H continuous mining machine; five motors, two 100 hp, one 30 hp and two 15 hp, 440 V, AC. Approval No. 2F-1465A, April 24.

Joy Mfg. Co.—Type 14BU10-1AE loading machine; five motors, two 20 hp, two 15 hp, and one 4 hp, 250 V, DC. Approval No. 2F-1466, April 30.

The Jeffrey Mfg. Co.—Type MM-88A colmol; three motors, two 100 hp and one 50 hp, 500 V, DC. Approval No. 2F-1467A, April 30.

In addition to the above, identification Symbol No. 112-BM was assigned to the Crescent Insulated Wire & Cable Co., Inc., to identify cables which have been accepted by the Bureau as being flame resistant.



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Cost Less to Own!

- **Rubber or Neoprene sleeves for abrasive and corrosive pulps and liquids**
- **1" to 14" inside diameter**
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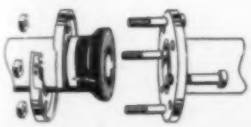
- **Temperatures to 200° F.**
- **Manual or power-operated closing mechanisms**
- **Automatic regulation and remote control available.**

Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

Unobstructed flow eliminates high friction loss.



Split flanges and Flex Seal ends assure perfect seal.

*Reduced operating costs.

and Laboratory Equipment, too

4" x 6" Massco Laboratory Jaw Crusher

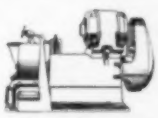
Welded steel frame; manganese steel jaw and cheek plates; bronze bushed bearings; smooth jaws give better product and easier cleaning. Adjust for plate wear and product size by convenient hand wheel adjustment.

6" and 10" Massco Gy-Roll Reduction Laboratory Crusher

Reduces ½" feed to as fine as 10 mesh in single pass. High capacity, low power consumption.

Laboratory Crushing Rolls

Sizes (Diameter x width): 8" x 4", 10" x 6", 10" x 8", 12" x 10" and 12" x 12". Adjustable roll space setting up to ¾". Double V-belt drive. Heavy, cast Meehanite frame absorbs vibration, results in long life.



Massco-McCool Pulverizers

Disc type grinder with a planetary movement. No gears. Will grind to 150 mesh in one pass.

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SALES AGENTS in Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the U. S.

Current Coal Patents

By: Oliver S. North

Boring type mining machine with adjustable boring head, E. J. Hlinsky (assigned to Goodman Mfg. Co., Chicago, Ill.), Apr. 14, 1959. Hydraulic piston and cylinder device for moving the cutter of a boring type mining machine to and from its cutting position. The control circuit is divided into low and high pressure portions, whereby high pressures generated by external forces on the piston member are confined to the high pressure portion of the circuit. No. 2,882,031.

Jig, W. J. Smith (assigned to The Jeffrey Mfg. Co., a corporation of Ohio), Apr. 21, 1959. Design for a coal jig having a screen basket positioned ahead of the feed chute for separating float waste materials from the surface of the jigging fluid. No. 2,883,053.

Roof support structure for mine workings, H. Rutkowski (assigned to Hans Gerlach, Moers, Niderhein, Germany), Apr. 28, 1959. Design for mine roof supporting structures using props and pivotable girders. The inter-engaging ends of each girder are provided with stops which, upon joining with an adjacent girder, forcibly bring the holes for the hinge pins into register, at least in the vertical sense. No. 2,884,272.

Purification of coal distillation gases, O. Grosskinsky, A. Adelsberger and W. Klempt, Apr. 28, 1959. A method is provided for supplementing the ammonia losses occurring in the scrubbing of compressed raw coal distillation gases without necessity of using expensive special equipment. The method is particularly adapted to the removal of H_2S from coke oven gas, town gas, and the like, whereby only small amounts of CO_2 are absorbed. No. 2,884,304.

Process for the pyrolysis and gasification of hydrocarbonaceous materials, M. P. Sweeney (assigned to United Engineers & Constructors, Inc., Philadelphia, Pa.), Apr. 28, 1959. The process described, although directed mainly to the gasification of petroleum residues, is claimed also to be readily adapted to the carbonization of various types of coal, lignite, peat, etc. No. 2,884,368.

Floor clean-up mechanism for continuous miners, J. R. Sibley and R. J. Wacht (assigned to Joy Mfg. Co., Pittsburgh, Pa.) May 5, 1959. An improved floor clean-up mechanism includes conveyor scrolls operating at the floor level and having pivotal mountings so that the scrolls are readily swingable in horizontal and vertical planes. No. 2,885,054.

Material gathering mechanism, K. E. McElhattan (assigned to Joy Mfg. Co., Pittsburgh, Pa.), May 5, 1959. Coal gathering and loading mechanism of the oscillatory arm type having improved means for varying the lateral extent of the oscillatory motion of the arms. No. 2,885,056.

Troughing roller assemblies for flexible cable supported conveyors, R. F. Lo Presti (assigned to Goodman Mfg. Co., Chicago, Ill.), May 5, 1959. Improved mounting bracket for the troughing roller assembly of a flexible strand conveyor. The bracket firmly engages the support cable, and can be used with cables of different lay. No. 2,885,066.

Boring type mining machine having pivotally mounted pusher plate wings, J. Karlovsky (assigned to Goodman Mfg. Co., Chicago, Ill.), May 5, 1959. Design for simplified laterally extensible pusher plate wings which automatically adjust themselves by gravity to various cutting heights to which the boring head and trimmer may be adjusted. The wings can be collapsed to an out-of-the-way position to facilitate tramming movement of the machine. No. 2,885,196.

Process of coking solid carbonizable material, P. M. Yavorsky (assigned to Consolidation Coal Co., Pittsburgh, Pa.), May 5, 1959. In a method for increasing the rate of production of coke from bituminous coal, the coke oven is charged with alternate layers of coal and finely divided coke, and heat is then applied to the walls of the oven. The coke strata heat up rapidly and act as horizontal thermal walls. The capacity of a given oven can be increased by this method. No. 2,885,327.

Coal hydrogenation, P. C. Keith and F. Ringer (assigned to Hydrocarbon Research, Inc., New York, N. Y.), May 5, 1959. In a process for hydrogenating bituminous coal, the coal is partially hydrogenated and the mixture of liquid hydrogenation products and solid residue is then cracked in a hydrogen atmosphere at elevated temperature and pressure. Throughput is increased, and a high yield of liquid products is obtained. No. 2,885,337.

TRIAL SAMPLES

Of World-Famous WHITMORE'S Lubricants NOW IN AEROSOL SPRAY-ON CANS!

HANDI-LUBE LIQUID GEAR COMPOSITION

For open gears, sliding surfaces—exclusive formulas eliminate metal to metal contact, keep wear on the lubricant not the metal—no breakdown even after prolonged use under water—available for every climatic condition—packaged in handy 16-oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

WIRE ROPE SPRAY LUBRICANT

Exclusive formulas for lubricating and protecting wire rope, chain, springs. Penetrates to the core of wire rope minimizing internal friction and increasing usable life up to 300%—special protective qualities absolutely eliminate corrosion—non-gumming qualities reduce "carry-back"—packaged in handy 16 oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

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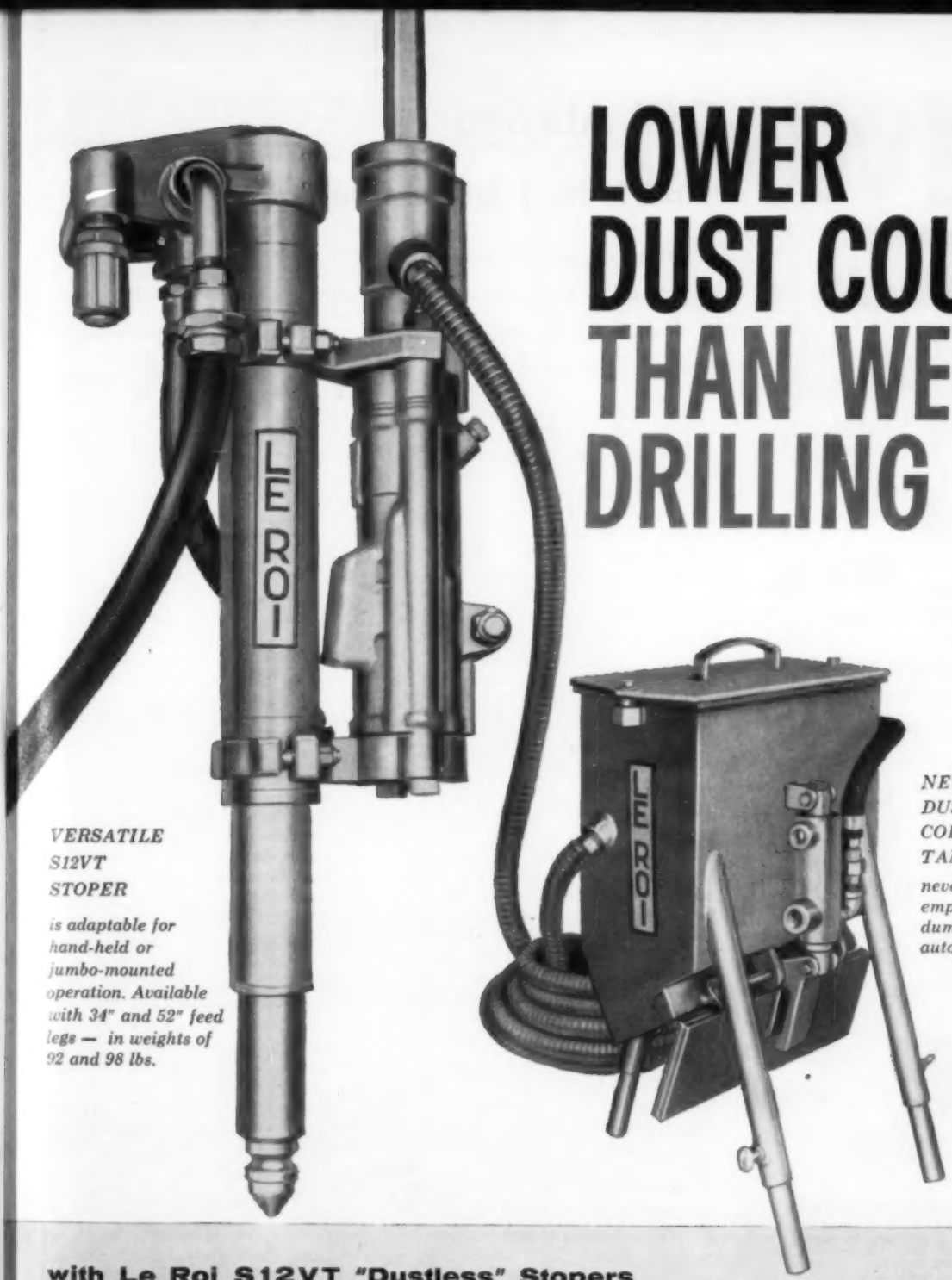

VERSATILE S12VT STOPER

is adaptable for hand-held or jumbo-mounted operation. Available with 34" and 52" feed legs — in weights of 92 and 98 lbs.

NEW LX-1 DUST COLLECTOR TANK

never needs emptying — dumps automatically.

with Le Roi S12VT "Dustless" Stopers

This hard-hitting stoper gives you more benefits and eliminates all of the problems and expenses of wet drilling! It delivers 20% harder, faster blows than comparable machines — has a much lower dust-count than wet drilling. Its exclusive dust-collecting system passes cuttings through the chuck housing — *not through the stoper!* Tools work better, last longer. Steel *never* sticks even in soft, wet formations — or in hard strata.

Special aluminum-alloy leg reduces weight, stops corrosion, and cuts maintenance. Controls are on the leg — not on the stoper — for better balance and easier operation.

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PORTABLE AND TRACTAIR AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.

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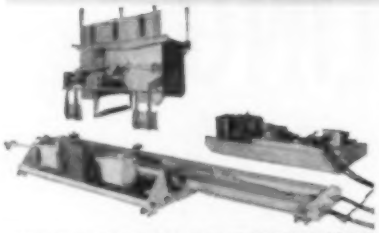
Revolutionary

NOLAN

"Build-It-Yourself" Plan for Automatic Loading Stations!



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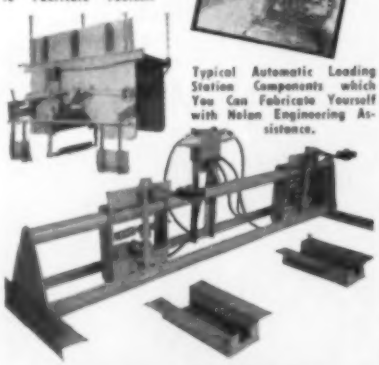
NOLAN OFFERS You Genuine NOLAN "Safety-Engineered" Components either for Complete Automatic Loading Station Units, or to Supplement Any Structural Parts You May Care to Fabricate Yourself



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1. Safety engineered Nolan drawings of certain components for your own fabrication, plus other essential units supplied by Nolan, for your finished assembly.
2. All components furnished by Nolan for your finished assembly.
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Lovitt Safety Limited, Toronto 10, Canada.

Coal Abroad

Imports Hurt British Coal

Coal industry spokesmen hit imports of cut-price oil . . . express concern over possibility of "dumped" methane.

British oil consumption increased by more than 25% last year, largest increases being recorded in fuel oil for industrial and domestic use. Conversely, coal use suffered a rather sharp drop and the situation shows no signs of improving, according to reports.

At a recent debate on Britain's fuel policy, coal and labor interests attacked the government handling of fuel problems as "uncoordinated." The country's ailing coal industry, the criticism went, isn't being helped any by cut-price oil being dumped in Britain.

Another bone of contention was the planned importation of American methane gas. Opposition accused the government of putting a "cloak of secrecy" over the methane gas shipments (first experimental shipments arrived in Britain 2 mo ago—Ed.).

"All we know," one criticizer pointed out, "is that the British gas council is lined up with an American company called Constock International Methane Co." He added that "the Americans are not so fond of us that they want to spend a lot of money giving us the advantage of their research, so this link would have as its first principle selling as much liquid methane as it could to this country."

Britain's coal stocks are expected to top 3 million tons this year and the National Coal Board's loss for the last fiscal year is estimated at $14 million. In response to questions on recent closures of mines the government said that although no further closures of uneconomic coal mines are planned this year, eventually some would have to close as they are replaced by new workings.

FRANCE—Coal production in this country dropped to 15,762,300 metric tons in the first quarter of 1959 compared to 16,055,400 in the same period in 1958. Major cause, say reports, was fewer working days in March of this year than last which drove down production to 5,190,700 tons compared to 5,459,400. Output per man shift rose to 1.88 tons per 80 hr compared to 1.85 tons in 1958. Total number of miners employed dropped to 203,560 this March from 207,060 in the same month last year.

YUGOSLAVIA—In 1958 coal output in this country totalled about 19 million tons or about 5% more than in 1957. Target set by the government for 1959 is 20.3 million tons of coal and production is to be slowly increased until 1961 by which time at least 24.3 million tons are expected to be mined annually.

AUSTRIA—Anxious to find new uses for domestic lignite and sub-bituminous coal, this nation will soon begin experiments with underground gasification of coal. The Oesterreichische Alpine Montan A. G., leading Austrian lignite, iron ore and steel producer, has been asked to draw up a statement on the feasibility of sub-soil gasification of about 200,000 metric tons of lignite per year.

JAPAN—Although Japan's economy is fast recovering the coal industry is still earthbound. Unsold coal stockpiles have reached a record level of 11 million tons. To bring the stockpiles down to 6.5 million tons by the end of next April, the Ministry of International Trade & Industry has imposed production quotas on coal of 83.2% of the normal production level, excluding coking coal, from May 1 to Oct. 31. Japan produced 43,670,000 tons in 1957 and 39,095,000 tons in 1958.

CANADA—Despite the fact that its surplus of coal is touching record heights, Japan has placed an order with West Canadian coal mine operators for 100,000 long tons of coking coal and Canadian producers anticipate still further orders. The high-grade coking coal, say reports, will be used by a group of seven large steel companies in central and western Japan. It will be blended with coal produced in Japan to obtain a coal suitable for manufacture of pig iron and steel.

KOREA—Pierce Management Corp., mining and management engineers of Scranton, Pa., has concluded a contract with the United States and Korean governments for advisory management of Korean coal mines. A team of five Pierce management employees left early in May for Korea.

RUSSIA—A coal center to be larger than the Donets Basin, leading Soviet coal mining area, is now in its advanced build-up stage, according to reports. Called Kazakhstan S. S. R. and located in Soviet Central Asia, the new coal center emphasizes the overall shift of industrial development from the western territories of the USSR to the East.

FOR USE ON BORING TYPE MINERS

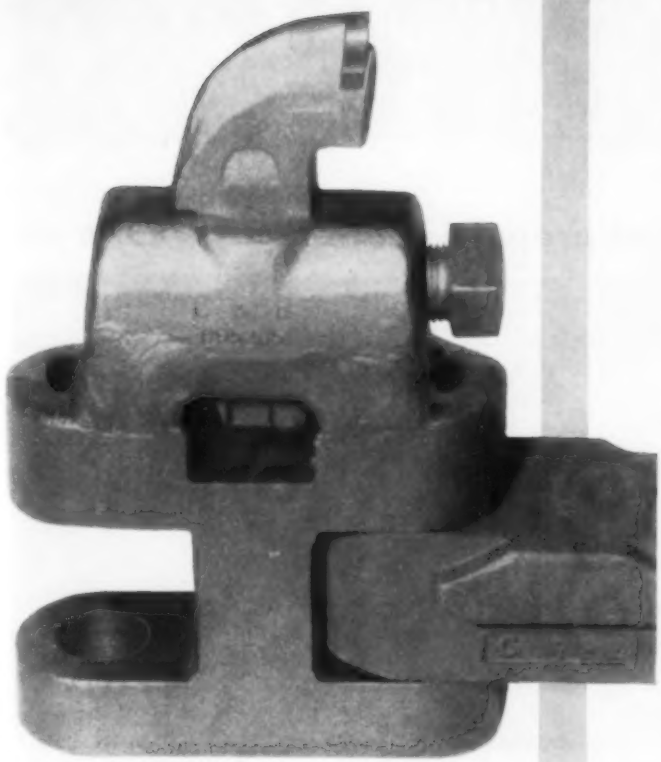
1ST IN THE FIELD—1ST IN EFFICIENCY!

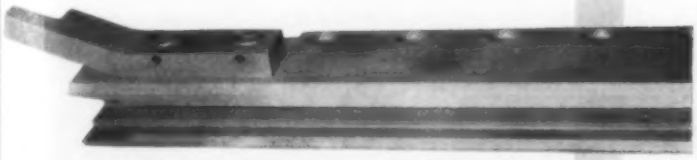
CINCINNATI

OFFERS A

TRIMMING CHAIN COMBINATION

THAT TOPS 'EM ALL





HERE'S A CINCINNATI EFFICIENCY-PROVED AND MINE-TESTED COMBINATION consisting of the popular Cincinnati Trimming Chain . . . Trimming Chain Guides and Sprocket. This Cincinnati Chain for use on boring type miners is designed to utilize the full potential of your high productive mining machines. Cincinnati Chains are made of drop forged alloy steel components coupled with extra large wearing surfaces. Specially designed and manufactured to exacting standards of CINCINNATI MINE, this chain is the finest and most widely used trimming chain available to the coal mining industry.

THIS CINCINNATI TRIMMING CHAIN GUIDE with its specially designed Sprocket Scraper, a feature pioneered by CINCINNATI MINE, is gaining in popularity wherever used. The Cincinnati Sprocket Scrapers on Cincinnati Trimming Chain Guides greatly minimize down time due to sprocket and guide failures. For the best in trimming chain guides . . . it's "CINCINNATI".

FOR maximum life and top efficiency, we recommend that only CINCINNATI SPROCKETS be used with CINCINNATI CHAINS. Made from a solid drop forging embodying all the features characteristic of Cincinnati Sprockets, these trimming chain sprockets assure perfect tracking of the chain and long sprocket life.

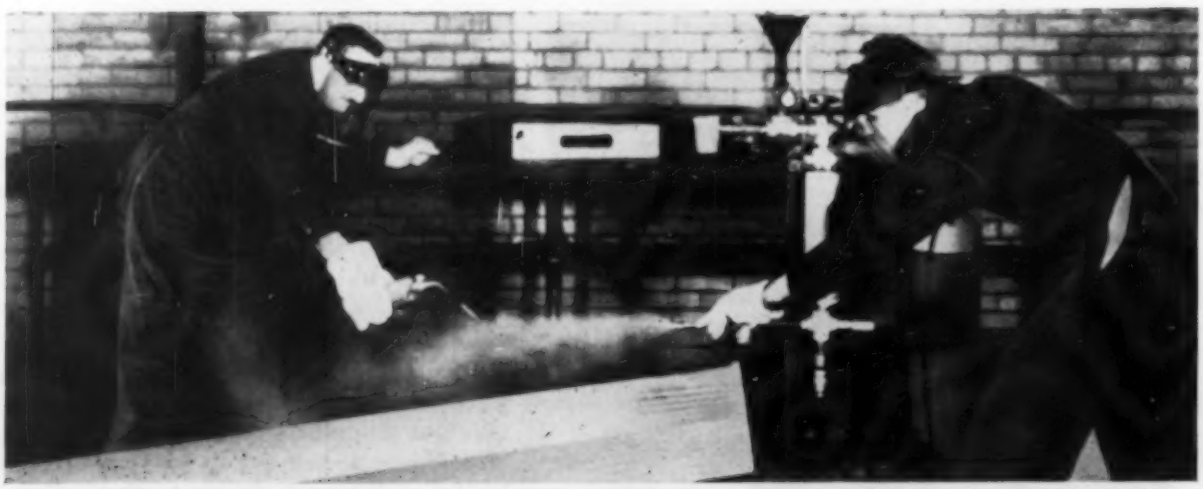
THE CINCINNATI MINE MACHINERY CO.

CINCINNATI 25, OHIO

First low-cost

Flame tests prove fire-resistant properties of this hydraulic oil

Dramatic photo above shows flammability of conventional hydraulic oil.



Not so dramatic, but . . . see how Shell 3XF Mine Fluid resists flame.

Photos courtesy: U. S. Bureau of Mines

SHELL 3XF

fire-resistant mine fluid

Shell 3XF Mine Fluid has been tested by U. S. Bureau of Mines and is now in use

Now—for the first time in mining history—an inexpensive, fire-resistant emulsion-type hydraulic fluid is available for mine equipment use—Shell 3XF Mine Fluid.

NO MAJOR MODIFICATION OF EQUIPMENT IS NECESSARY—Shell 3XF* is a direct replacement for ordinary hydraulic oils now in service.

CONVENIENT TO USE—Shell 3XF Mine Fluid, furnished as a concentrate, is mixed with water to prepare the emulsion *at the mine location.*

PROOF OF ITS FIRE-RESISTANT QUALITIES—In addition to recommending the use of fire-resistant hydraulic fluids in mining machinery, the Bureau of Mines has evaluated Shell 3XF Mine Fluid using test methods that determine fire-resistant properties, and accepted it for Mine evaluation, pending the establishment of a Bureau approval schedule.

FOR COMPLETE INFORMATION on Shell 3XF Mine Fluid, write or call Shell Oil Company, 50 West 50th Street, New York 20, New York, or 100 Bush Street, San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.

*Trademark

MINE FLUID

SHELL

Austin plastic connectors provide a quick fuse hook-up. Simply thread fuse from shot hole through length of connector and press trunk line into grooved slots. Then return branch line through end of connector on other side of trunk line and pull tight.

AUSTIN
Detonating Fuse

promotes blasting efficiency

Filled with a high explosive core, Austin Detonating Fuse possesses sufficient strength and speed to initiate an entire column of explosives . . . connects all holes with an effective detonating agent.

Austin Detonating Fuse is easy to handle, too. It's light in weight and flexible with a tough, waterproof coating that won't crack, chip or peel when being laid.

3 types—There's a type of Austin Detonating Fuse for virtually any purpose. Type 60 is standard. Type 100 is more powerful and for less sensitive explosives and blasting agents. Type 175 is for use with uncoated ammonium nitrates.

All 3 types are insensitive to shock, abrasion and strong electrical currents. They can be detonated only with fuse and cap or electric blasting cap. AA-8674

USED IN 1833 AUSTIN EVER SINCE

AUSTIN
POWDER COMPANY
CLEVELAND 13, OHIO

explosives ◆ ammonium nitrates ◆ primers ◆ detonating fuse
permissibles ◆ blasting supplies ◆ AP drill heads and bits ◆ mine tools

Preparation Facilities

Mathies Coal Co., Courtney, Pa.—Contract closed with The Deister Concentrator Co., Inc., for nine Concenco No. 77 Diagonal Deck washing tables for cleaning 1/4x0 coal.

Slab Fork Coal Co., Slab Fork, W. Va.—Contract closed with The Deister Concentrator Co., Inc., for four Concenco No. 77 Diagonal Deck washing tables; one Concenco revolving feed distributor, Model 108-B; and four Concenco 2-way splitters.

Enos Coal Mining Co., Enosville, Ind.—Contract closed with Link-Belt Co. for thermal drying equipment to clean 430 tph of 1x21 mesh coal. Scheduled completion, Dec. 1, 1959.

Slab Fork Coal Co., Slab Fork, W. Va.—Contract closed with Western Machinery Co. for Wemco Fagergren flotation equipment to handle 25 to 30 tph of minus 28x0 mesh coal.

United States Steel Corp. (through Allen & Garcia Co.), Maple Creek mine, New Eagle, Pa.—Contract closed with Western Machinery Co. for Wemco Hi-Intensity conditioners and Wemco Fagergren flotation equipment to handle 30 to 40 tph of 48x0 mesh coal.

United States Steel Corp. (through Allen & Garcia, Co.), Alpheus plant, Gary, W. Va.—Contract closed with Western Machinery Co. for Wemco Hi-Intensity conditioners and Wemco Fagergren flotation equipment to handle 140 tph of 30x0 mesh coal.

Bituminous Output

YEAR TO DATE	PRODUCTION
May 16, 1959	156,255,000
May 17, 1958	148,603,000

1959 output 5.1% ahead of 1958.
A month earlier output was 0.8% ahead of 1958.

WEEK ENDING	PRODUCTION
May 16, 1959	8,185,000
May 17, 1958	7,318,000

Anthracite Output

YEAR TO DATE	PRODUCTION
May 16, 1959	7,470,000
May 17, 1958	7,956,000

1959 output 6.1% behind 1958.
A month earlier output was 2.8% behind 1958.

WEEK ENDING	PRODUCTION
May 16, 1959	324,000
May 17, 1958	385,000

How to get *EXTRA* truck-trips per shift

Sharp turning angles and easy handling are important reasons why Macks can shave precious minutes from your truck cycle time . . . give you *extra* trips—bonus earning time—shift after shift.

Spotting under shovels in 1-2-3 order; negotiating hairpin turns with capacity loads aboard; backing into the tightest corners with swift smoothness—big Macks are a study in maneuverability.

Moreover, Macks have the extra guts and go for steady, economical performance on the world's most rugged jobs . . . jobs that wear out other makes over the long haul. There's a heavy- or super-duty Mack, up to 40-ton capacity, that's engineered to and beyond your specifications. Check your Mack branch or distributor today. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

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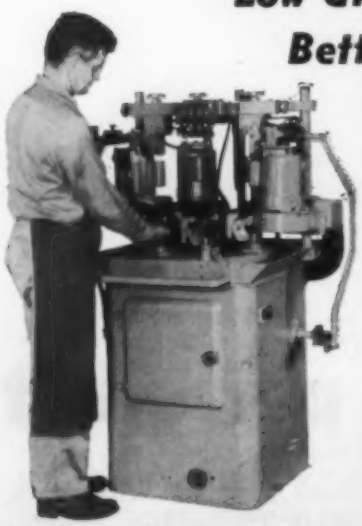
TRUCKS

Old Timers Club Holds Affairs . . . Presents Awards

G. H. JENKS, former president and present director of the Old Timers Club, awards to Warren H. Nangle (photo left), Logan, Ohio, the annual Old Timers Club watch award at Ohio State University, while Prof. J. Richard Lucas of the Mining Engineering Department looks on. The award is given each year at the university to the "most outstanding senior mining engineering student" and consists of an engraved watch with that citation. In the photo at the right, Adolph W. Petzold, a January graduate of Pennsylvania State University receives a similar watch award from M. D. Cooper, secretary-treasurer of the Old Timers Club, in ceremonies held at Penn State. Mr. Petzold was picked as the outstanding mining engineering graduate to enter the coal industry and is now with Island Creek Coal Co.



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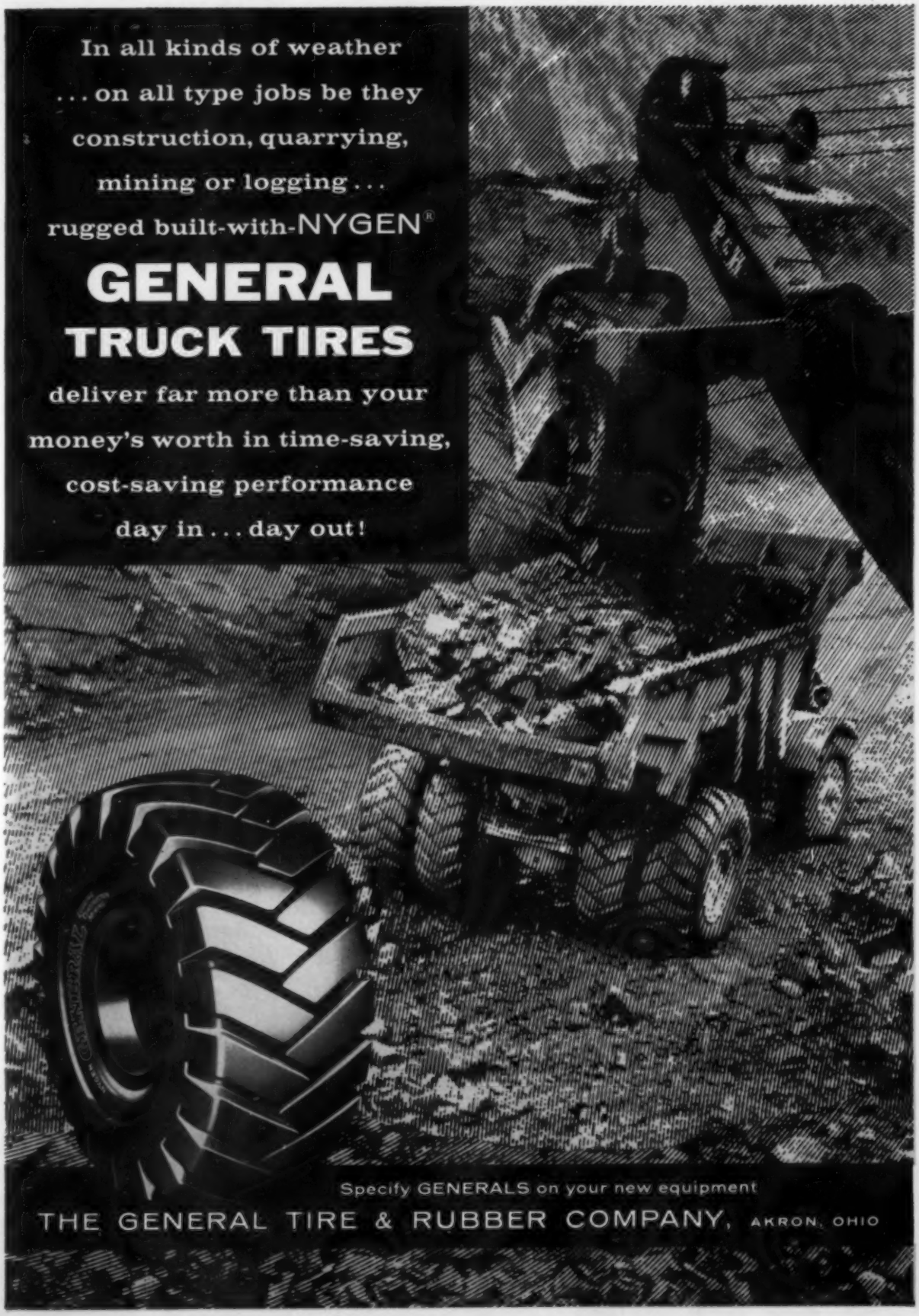
New Books

Coal Preparation

Second Symposium on Coal Preparation is a collection of 18 papers presented at the University of Leeds, England, October 21-25, 1957. Among the topics discussed by international experts are possible changes in the coal preparation pattern, moisture retention properties of fine coal, froth flotation, plant performance, jig washing and the value of testing preparation plants. 513 pp. 5½x8½-in; cloth. 20/, The Secretaries, Coal Preparation Plant Association, P. O. Box 121, 301 Glossop Rd., Sheffield 10, England.

Engineering Materials

Creep of Engineering Materials, by Iain Finnie and W. B. Heller. Here is a comprehensive work on the creep of engineering materials, treating design for creep conditions thoroughly to aid in solving engineering problems. The book combines the fundamentals of material behavior with important engineering applications and points out the advantages and limitations of different materials which undergo creep. The authors combine the viewpoints of the physicist and engineer to provide engineers with practical help in selecting materials for structural applications. 341 pp. 6x9-in; cloth. $11.50, McGraw-Hill Book Co., Inc., 330 W 42nd St, New York 36, N. Y.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mining or logging ...
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deliver far more than your
money's worth in time-saving,
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Or have you installed USS National Polyethylene Pipe? If you have, then you're not troubled with corrosive mine water slowing work progress and eating at your equipment.

USS National Polyethylene Pipe is the answer to mine drainage problems; it resists attack from corrosive mine water, acids, alkalies, salts, and other mine chemicals. And no more costly pipe replacement—it's made to last.

Abnormal mine temperatures won't crack Polyethylene Pipe, even at degrees down to —90°F., and up to +120°F. It's light, easy to install, and flexible enough to turn corners and go over and under obstructions.

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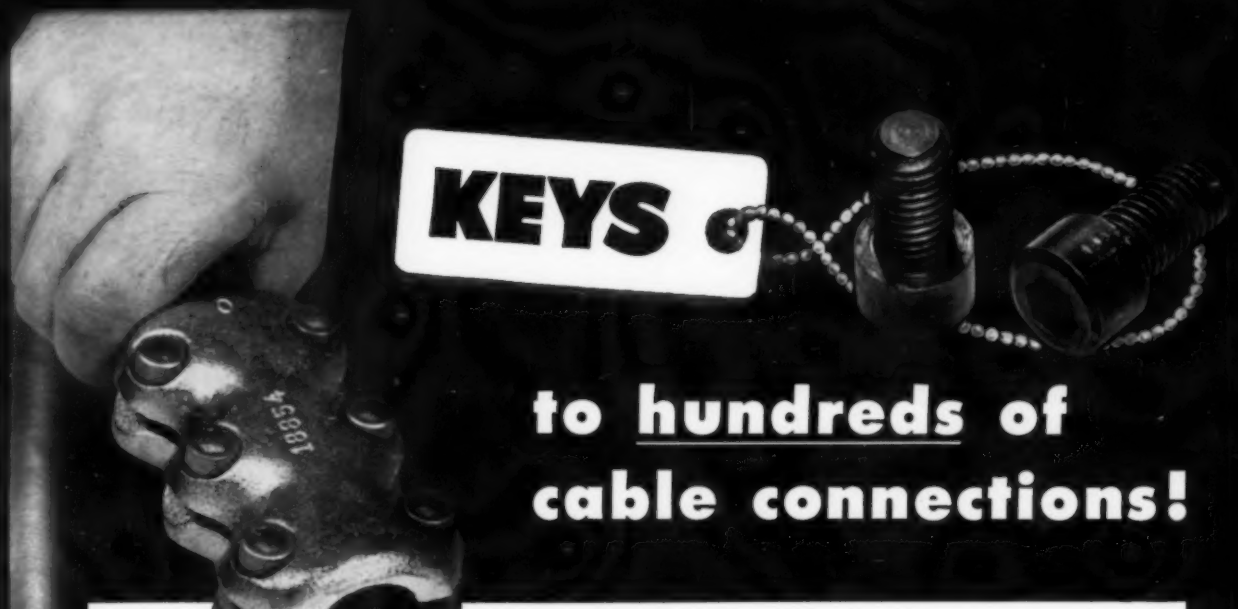

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O-B Cap Screw Connectors

for straight-thru, tap-off, or three-way connections between same or different size cables either copper or aluminum or both

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You'll make better cable connections—and better time—with O-B "Cap Screw" Connectors!

Leave connector halves (shown above and below) permanently attached to your cable ends, and you can make most of the connections you need—between same or different size cables—copper or aluminum—simply by tightening two cap screws.

For adding or removing sections of machine cable, for temporary feeder extensions, for switch and panel connections—for every type of cable connection where speed, dependability, and interchangeability are important advantages.

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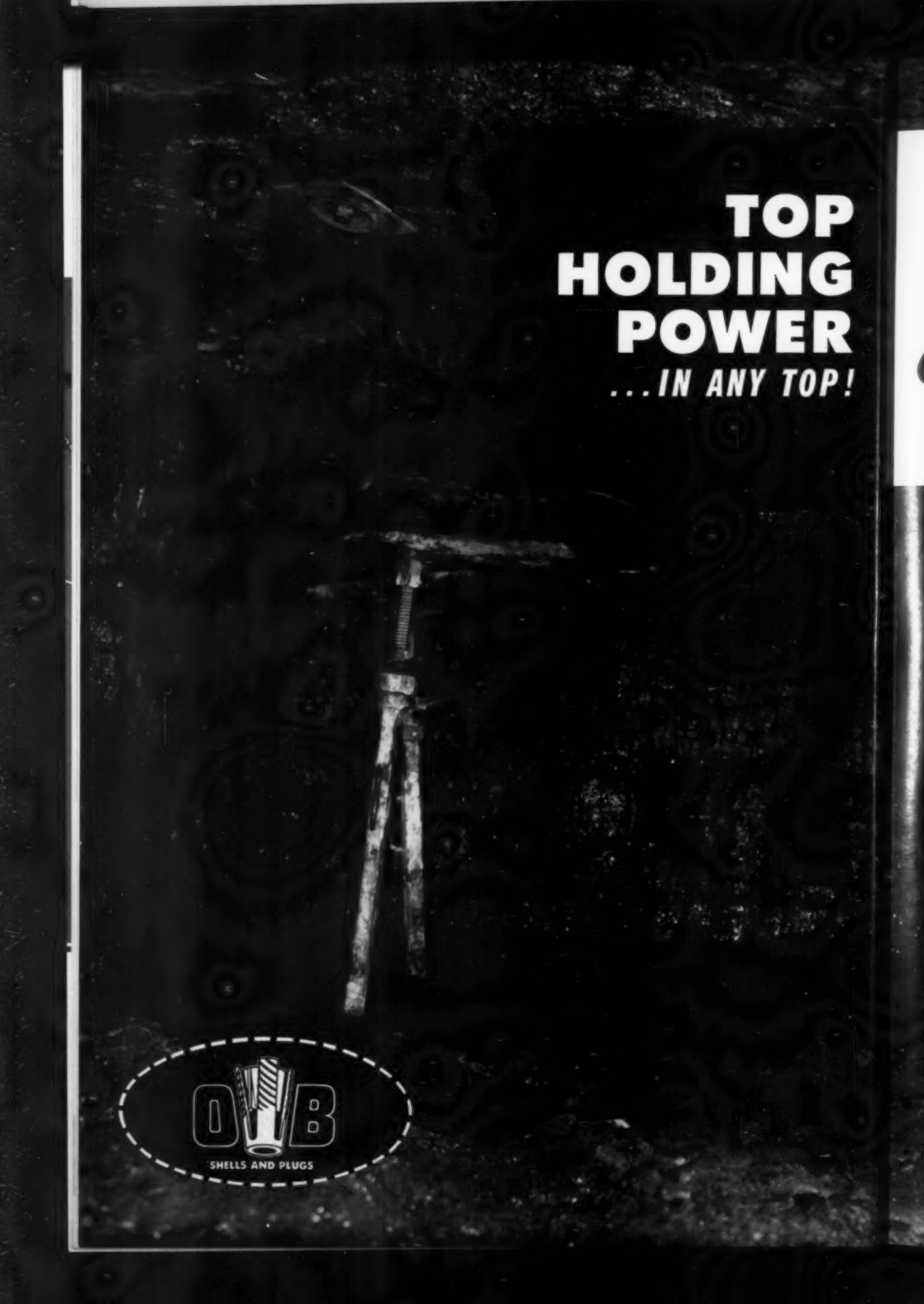
EXPANSION SHELLS AND PLUGS · LINE MATERIALS · SAFETY AND CONTROL EQUIPMENT · ELECTRIC HAULAGE MATERIALS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SHELLS AND PLUGS

The holding power of O-B Shells and Plugs has been tested in all kinds of roof strata for more than a decade.

Their ability to adapt to the wide variety of roof structures encountered in coal mining—to find dependable anchorage in everything from soft, friable shale to hard rock—is unequalled by any other type of expansion unit in use today.

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O-B Bail-Type Unit

fast, firm support for cable or pipe...

O-B Roof Plate Hooks!

Here's a new type of support for cable or pipe up to 2½ inches in diameter!

No slots, wedges, or parts to fool with or lose. Just a simple, inexpensive, practically indestructible malleable iron hook that you drive between roof plate and roof with a few hammer blows.

No sharp edges, no wobble, no accidental pull-out. Tapered support arm is serrated on top and bottom surfaces so it drives in easily and stays put when pushed or pulled from any direction. When the job is done, hammer it out from the opposite direction and use it again—and again. The high-quality malleable iron takes plenty of pounding without cracking or breaking.

Get your cable or pipe "out from under" foot or wheel this safe, easy, economical way.

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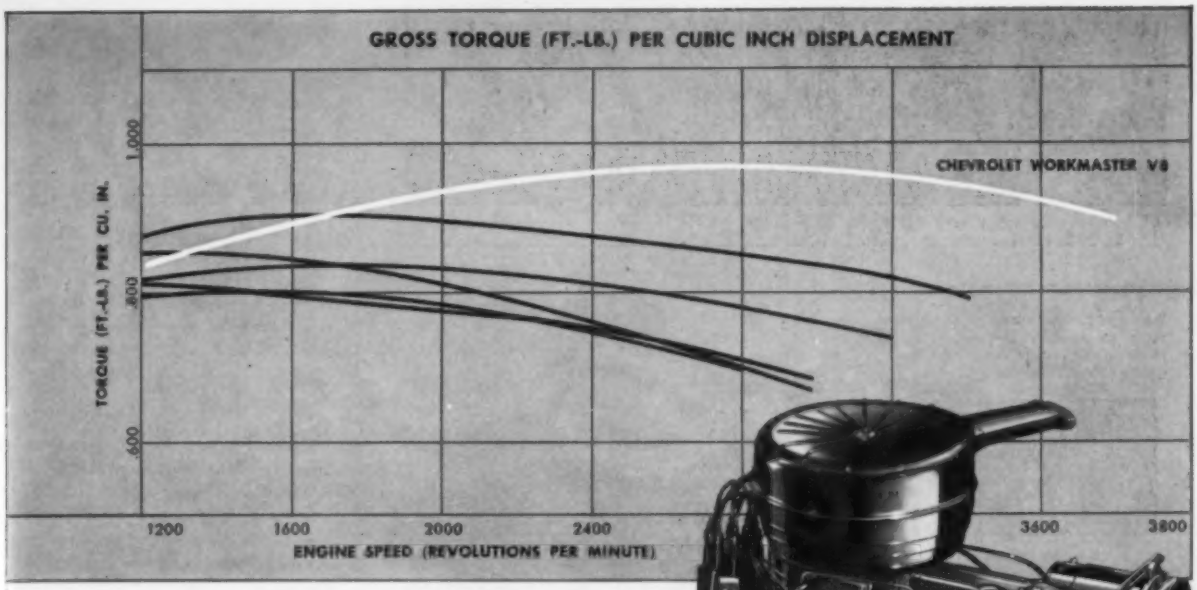
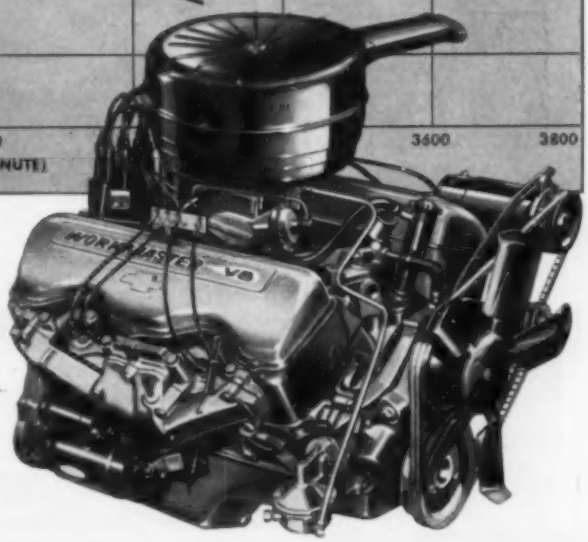
4942 M

It's torque that beats tough jobs, and this engine has it to spare!



Proof that the Workmaster V8 puts out plenty of torque. The white curve above shows that the Workmaster provides high torque throughout the *entire range* of operating speeds. The black curves accurately represent the torque output of typical heavy-duty 6-cylinder engines of between 330 and 390 cubic inches of displacement. Curves demonstrate actual torque efficiency, based on gross ft.-lbs. of torque per cubic inch of displacement.



CHEVROLET'S 348-CUBIC-INCH WORKMASTER V8

It's torque that gives a truck plow-horse pulling ability at low speeds and assures the power to keep big loads moving, whether it's through the rough or over the road. And Chevrolet's 230-h.p. Workmaster V8 puts out a brand of torque that's made to order for your toughest big-tonnage hauls.

High torque output is the natural result of the Workmaster V8's unique design characteristics. Short piston stroke and large piston area, for example, comprise a torque-producing advantage, and *this engine provides the shortest stroke in its class.*

Advanced Wedge-Head design, with its fully machined combustion chambers, means high torque, too. It assures high turbulence of the fuel-air mixture and balanced power output from each cylinder. The Workmaster V8 has high volumetric efficiency . . . takes in the fuel-air mixture *efficiently* at all speeds. This, combined with a camshaft design that gives just the right valve lift and timing, assures high torque—extra pulling power to get you through the tough spots!

For the kind of torque and toughness you need to do big jobs better, see your Chevrolet dealer about a Workmaster V8, now standard in Series 90 and 100 trucks. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

No job's too tough for a Chevrolet Truck!

CHEVROLET

SEEN conducting "Symposium on AC Mining Systems" at Ohio State University's Annual Conference for Engineers are: G. McCaa (left), general manager, Hanna Coal Co.; Prof. R. L. Frantz, Ohio State University; G. H. Jenks, director, Old Timers Club; J. L. Knight, superintendent, Union Carbide Metals Co.; D. E. Hamilton, applications engineer, mining, General Electric Co.; and Prof. J. R. Lucas, head, Mining Engineering Dept., Ohio State University.

Meetings

West Virginia School of Mines, Mining Extension Dept.'s Ninth Annual Short Course in Coal Preparation, June 8-July 17 — West Virginia University, Morgantown, W. Va.

Open Pit Mining Association, June 18—Missouri School of Mines & Metallurgy, Rolla, Mo.

Mine Inspectors Institute of America, June 21-24—Terre Haute House, Terre Haute, Ind.

Air Pollution Control Assn. annual meeting, June 22-26—Hotel Statler, Los Angeles. Technical sessions and exhibits devoted to air pollution control.

Rocky Mountain Coal Mining Institute, June 28-July 1 — Antlers Hotel, Colorado Springs, Colo. Subjects include modern mining methods, new equipment, safety, etc.

International Briquetting Association, Briquetting Conference, August 24, 25 and 26—Glacier Park Lodge, Glacier Park, Mont.

Gordon Research Conference, June 15 to Sept.—Colby Junior College, New London, N. H., New Hampton School, New Hampton, N. H., and Kimball Union Academy, Meriden, N. H. Lectures and conferences to stimulate research in science.

The Council of Underground Machinery Manufacturers, Mining Machinery Exhibition, July 9-18—Grand Hall, Olympia, London, Eng. Includes display of mining equipment made during last decade.

Exploration Drilling Symposium annual meeting, Oct. 8-10—Penn State University, University Park, Pa. Sponsored by mining departments of Penn State, Colorado School of Mines and the University of Minnesota.

When you order screens, be sure to specify the type which best meets your requirements. For example:

For maximum through capacity, CF&I Space Screens with rectangular openings are recommended. The high percentage of open area provides considerable freedom from blinding or clogging.

For maximum freedom from blinding or clogging, CF&I Long Slot Space Screens are the most efficient construction. Because of the open area and intense vibration of wires on the long sides of the openings, material can not cling or build up.

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SPACE SCREENS

for every coal screening operation

For economical, general screening specify Wiscoloy screening made from special alloy steel. Carefully crimped and tightly woven, Wiscoloy is a rugged, general-purpose screen which provides long service on average jobs.

For corrosive conditions specify CF&I stainless steel screens. These durable screens are ideal for washing and other operations where wet, corrosive material is processed.

For scalping operations specify CF&I manganese screens. Rugged and shock resistant, they withstand the crushing, tumbling and pounding common in scalping operations and similar tough screening applications. Made of ¼" or heavier wire, they reduce costly downtime.

For engineering assistance in choosing the right space screen for your coal screening operation, contact our nearest branch office.

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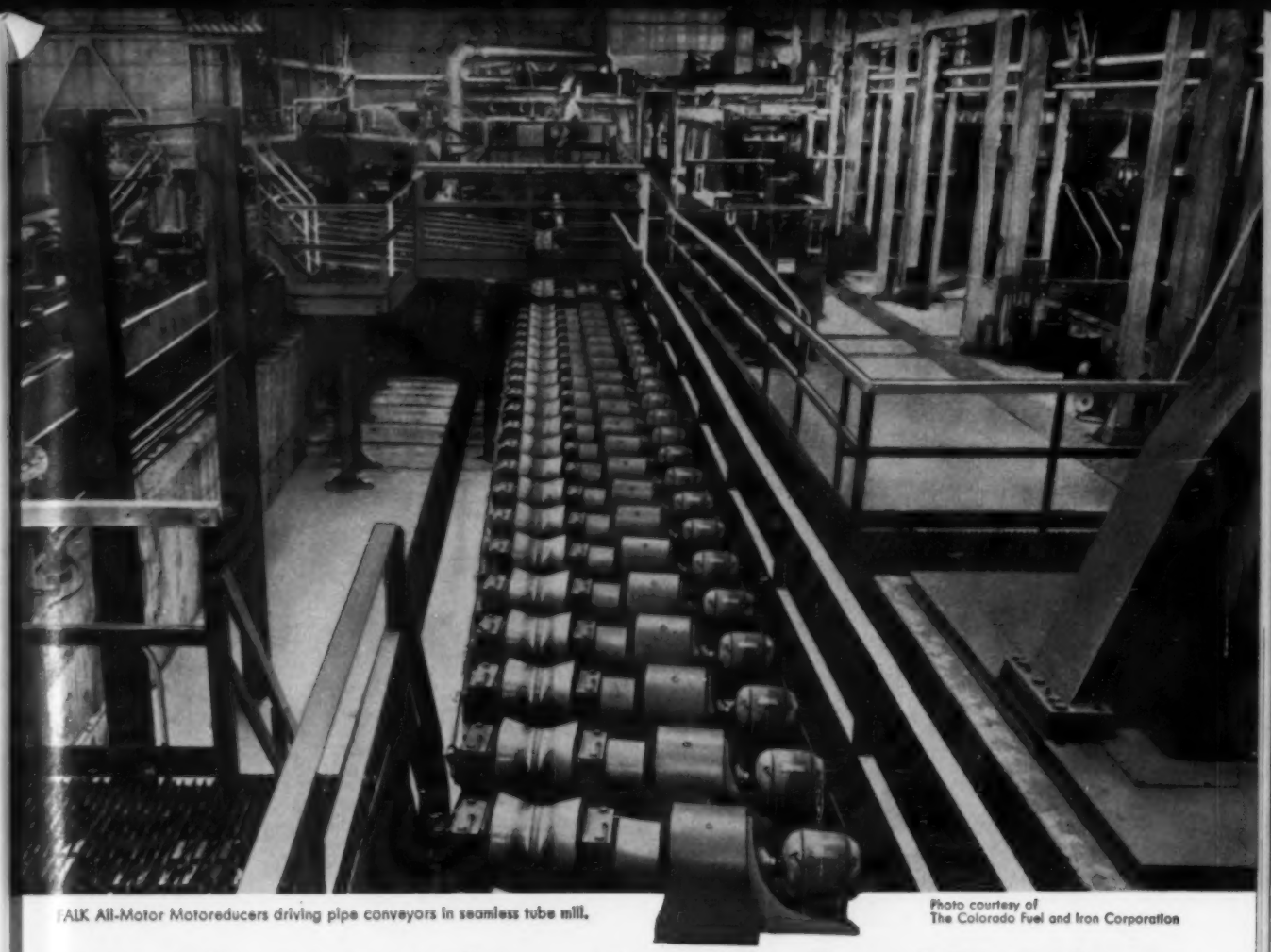
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte Denver • El Paso • Farmington (N.M.) • Ft. Worth • Houston • Lincoln • Los Angeles • Oakland • Oklahoma City Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita
In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans New York • Philadelphia. CF&I OFFICE IN CANADA: Montreal. CANADIAN REPRESENTATIVES AT: Calgary Edmonton • Vancouver • Winnipeg



FALK All-Motor Motoreducers driving pipe conveyors in seamless tube mill.

Photo courtesy of
The Colorado Fuel and Iron Corporation

You get these "extras" when you buy FALK *all-steel* Motoreducers

1. **Freedom from damaged housings.** The exclusive FALK *all-steel* construction gives full protection from cracked housings or torn-off feet...plus twice the ability of cast iron to maintain vital alignment.

2. **12-15% reserve load-carrying capacity** in the gears, by AGMA standards. The extra-depth, high pressure angle helical gears are another FALK exclusive ...they assure better operation and longer gear life.

3. **Highest known gear efficiency**—98½% per gear train under full load! This means maximum productive work for your power dollar.

4. **Longer service life**...advanced FALK design makes it possible to machine both bores for each shaft assembly at one time, thus eliminating possible accumulation of tolerances that occurs when individually machined parts are assembled. The result—better alignment of revolving elements that permits units to transmit rated capacity longer.

5. **Standard units to fit your needs.** Integral and All-Motor® Motoreducers are available in horizontal, vertical and right angle types...a type for every use.

Units are available up to 75 hp; output speeds from 780 rpm down to 1.2 rpm. Prompt delivery from factory, warehouse or distributor stocks. Ask your FALK Representative or Authorized FALK Distributor for *Bulletin 3100.*

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MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

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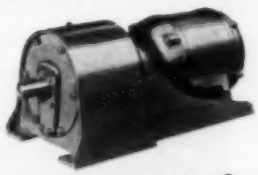
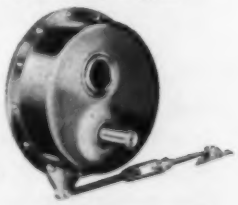


THE FALK ALL-MOTOR® MOTOREDUCER
the original All-Motor unit

(Shown) Horizontal concentric model. Also available in right angle and vertical types.



THE ALL-STEEL FALK® SHAFT MOUNTED DRIVE

Proved best for the countless industrial applications where a reducing unit mounting directly on shaft of the driven machine is indicated.

Units from 1/2 to 50 hp. Ratios —4:1, 14:1 or 24:1. Torque capacity up to 41,000 lb-in (in standard units). Prompt shipment from stock. For details, ask for ***Bulletin 7100.***

"Our Ford F-800's, pulling 20-ton payloads, give us mighty good service!"

says R. Dillard Teer, Vice President
Nello L. Teer Co., Durham, N. Carolina

"We operate about 115 Ford Trucks ranging in size from ½-ton pickups to Tilt Cab Tandem tractors. We believe in carefully fitting the truck to the job to be done and usually stay within the manufacturer's recommended ratings. We make an exception to this rule with our Ford F-800's, pulling 20-ton loads in aluminum trailer dumps to our quarry and crushing setup at Durham, North Carolina. These units are carrying the maximum legal limit and give us mighty good service!

"We haven't traded any trucks in about 6 years. It just happens that our company has been growing so rapidly that when we buy a new truck, usually an F-800, I put it under one of our trailer dumps. Then I'll take the old truck, lengthen the chassis, and make a grease outfit or a water wagon out of it. I would say out of over a hundred Ford units in the past 7 or 8 years, we have gotten rid of only a dozen altogether—and some of these were wrecked or burned.

"Another reason we use Fords is that this business is rough on trucks, so parts availability is very important. Our experience over the years with Ford as compared to Ford competitors has been definitely in favor of Ford on parts."

NOW! CERTIFIED PROOF!

FORD TRUCKS COST LESS

'59 Ford Pickups beat average mileage of other leading makes by 25.2% in Economy Showdown U.S.A.

Here at last is certified proof of the differences in gas mileage between six-cylinder pickups . . . evidence that you can use in your operation.

It was compiled by America's foremost independent automotive research firm after testing 1959 six-cylinder, ½-ton pickups of the six leading makes. All trucks were bought from dealers—just as you would.

The tests paralleled every kind of driving – high speeds and low, open highways and city traffic, even door-to-door delivery. And in every test, '59 Ford Sixes delivered more miles per gallon than any other make. Here are the actual percentages:

'59 FORD PICKUP SIXES GAVE

42.6% better mileage than make "D"
31.1% better mileage than make "I"
25.2% better mileage than make "C"
22.0% better mileage than make "S"
9.6% better mileage than make "G"

Taken together, Ford got 25.2% more miles per gallon than the average of all other leading pickups!

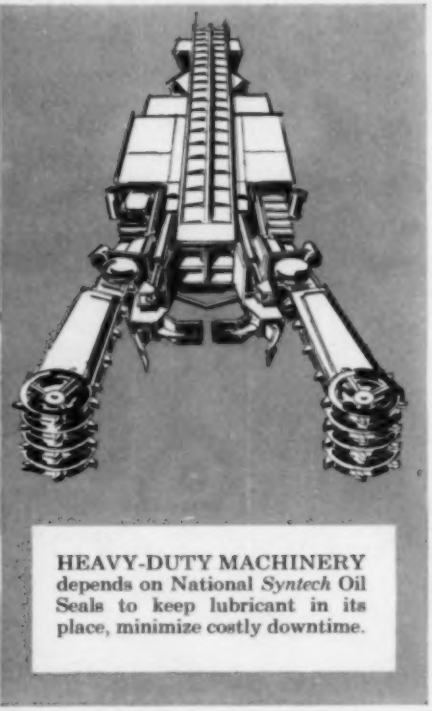
What's the secret of Ford's economy? First, of all pickup sixes, only the Ford Six has modern Short Stroke design which reduces friction and requires less fuel. Second, to this modern engine, Ford has added a new economy carburetor to meter fuel more precisely in both high- and low-speed ranges.

See your Ford Dealer for the full report of Economy Showdown U.S.A. and get the whole story firsthand.

All tests conducted and results
CERTIFIED
by America's foremost independent automotive research organization*
***NAME AVAILABLE ON REQUEST**
Send inquiry to P.O. Box 2687, Ford Division
Ford Motor Co., Detroit 31, Michigan

Now! During Dividend Days at your Ford Dealer's...Go *FORD*-ward for Savings

Better products, *faster,* from your Bearing Specialist:



HEAVY-DUTY MACHINERY depends on National *Syntech* Oil Seals to keep lubricant in its place, minimize costly downtime.

National "prescription-blends" a synthetic just right for the heavy-duty oil seals you need

National *Syntech* Oil Seals feature: 1. Synthetics "prescription-blended" to meet specific operating conditions; 2. Minimum tension on garter spring to reduce shaft-torque, increase seal life; 3. Accurately sized O.D.'s.

A National *Syntech* oil seal can be formulated to keep lubricant *in,* dirt *out* on the roughest jobs in a mine!

Temperature extremes, shaft speeds, solvent-, fatigue- and abrasion-resistance—these and other factors go into choosing the *best* synthetic for a heavy-duty oil seal. National can "prescription-blend" a Syntech seal just right for *any* job!

Basic ingredients for synthetics developed and perfected by National are compounded by coded formulas. Each batch is mixed and blended separately, then tested and approved before release. A finished "prescription" is extruded, bonded and molded . . . machined to size and assembled into Syntech seals that'll save time and money in your machines and equipment.

Whether you use synthetics or leather, you can get the heavy-duty oil seal you need—*when you need it*—from your Bearing Specialist selling National Seals. Call him today for fast service!

NATIONAL OIL SEALS

FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. DETROIT 13, MICHIGAN

NATIONAL OIL SEALS

tion resulting in reduced skidding and increased highway safety.

The process is seen as feasible by many parties because the Curtiss-Wright binder doesn't require any special equipment to prepare or lay it. It can be combined in existing hot-batch plants and will be handled by the same equipment now used by state and municipal road departments and blacktop paving contractors.

Curtiss-Wright believes its new product, which can also be used for roofing, shingles, floor tiles, tar paper, drain pipes, automobile undercoating and other applications, may be a key to girding up the coal industry and decreasing unemployment levels in distressed areas.

Research Award

Drs. James D. Batchelor and Everett Gorin of the Research & Development Div. of Consolidation Coal Co., Library, Pa., have been named recipients of the Bituminous Coal Research, Inc., award for the best paper pertaining to coal and derived products presented at the 1959 spring meeting of the Div. of Gas & Fuel Chemistry of the American Chemical Society.

Their paper was entitled "Desulfurization of Low-Temperature Char. II—Rate Data in a Continuous System." Bituminous Coal Research, Inc., established this semi-annual award in cooperation with the Div. of Gas & Fuel Chemistry of the American Chemical Society to stimulate the presentation of more papers relating to coal and derived products and to improve their presentation. In judging the papers equal rating is given to the quality of presentation and to the scientific or technical content of the papers. The Gas & Fuel Chemistry Div. makes the selection.

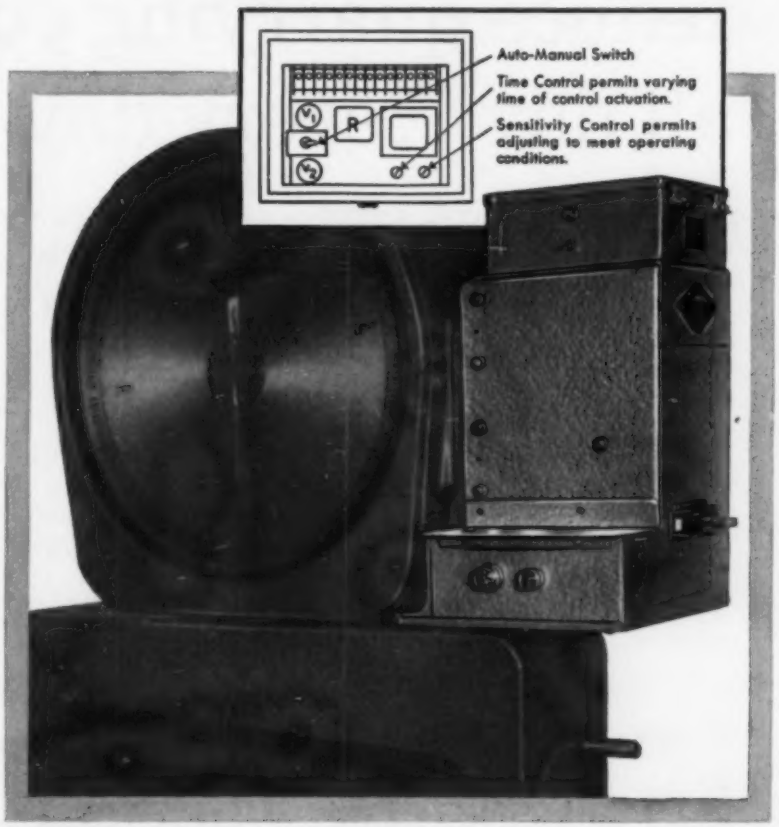
Renew Fellowship

The United States Steel Foundation, Inc., has announced the renewal of a doctoral fellowship for Thomas V. Falkie, graduate student in mining engineering at Pennsylvania State University for the year 1959-1960.

Mr. Falkie has completed one year as a Foundation fellow pursuing a course of study leading to a Ph.D. degree with a major in mining engineering. He holds a Bachelor and Master's degree from Penn State in the same field. As a graduate student, his research interests have been fluid-solids separation and mine production engineering involving the application of industrial engineering to mining problems.

(Continued on p 68)

NEW Fairbanks-Morse Electronic Weight Detector



Prevents incorrect weighing . . . stops costly errors!

With the new Electronic Weight Detector, true weight of any load can be automatically obtained and recorded without need of a weighman. Where a weighman is used, it is impossible for him to record incorrect weights or start a sequence at the wrong time. When desired, a flip of the switch can disengage the Weight Detector entirely from the system. *This is the first fully-reliable control of its kind available in the scale industry.*

To completely automate your weighing—to be sure that your weights are correct—to protect yourself by completely policing your entire weighing operation—contact your nearby Fairbanks-Morse Field Engineer, or write directly to Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago 5, Illinois for complete information.

See Sweet's Plant Engineering File for full line of F-M Scales

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

SCALES • PUMPS • DIESEL, DUAL FUEL AND GAS ENGINES • ELECTRIC MOTORS
GENERATORS • COMPRESSORS • MAGNETOS • HOME WATER SYSTEMS

One P&H sells another because

P&H "PROFIT·TONS" reduce quarrying costs all day...every day

More responsive dipper action, as much as 30% more bail pull, faster swing and *maximum* availability all add up to lower cost per ton—more net profit for users of P&H Electric Mining Excavators.

As much as 10% more production with P&H Electrics in leading mines and quarries throughout the world is the end product of patented *exclusive* P&H design principles.

MAGNETORQUE® . . . the most advanced hoist drive known for electric excavators. This hoist drive electro-magnetically transmits digging power from an A.C. hoist motor direct to the dipper. It provides higher bail pull and faster dipper fill with an *exclusive* degree of protection for the hoisting machinery from digging stresses.

ELECTRONIC CONTROL . . . the most responsive control for electric excavators, it accomplishes the fastest work cycles known. This closed circuit, adjustable energy system has no moving parts, and offers reductions in control maintenance expense of as much as 80%.

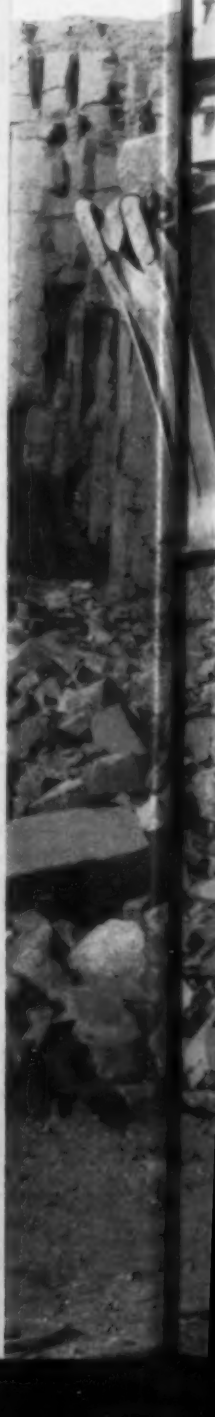
Also, with P&H you get single source responsibility—an exclusive advantage experienced only by users of P&H Electrics. P&H manufactures their own electrical equipment—*designed specifically for electric shovel service*—as well as mechanical equipment.

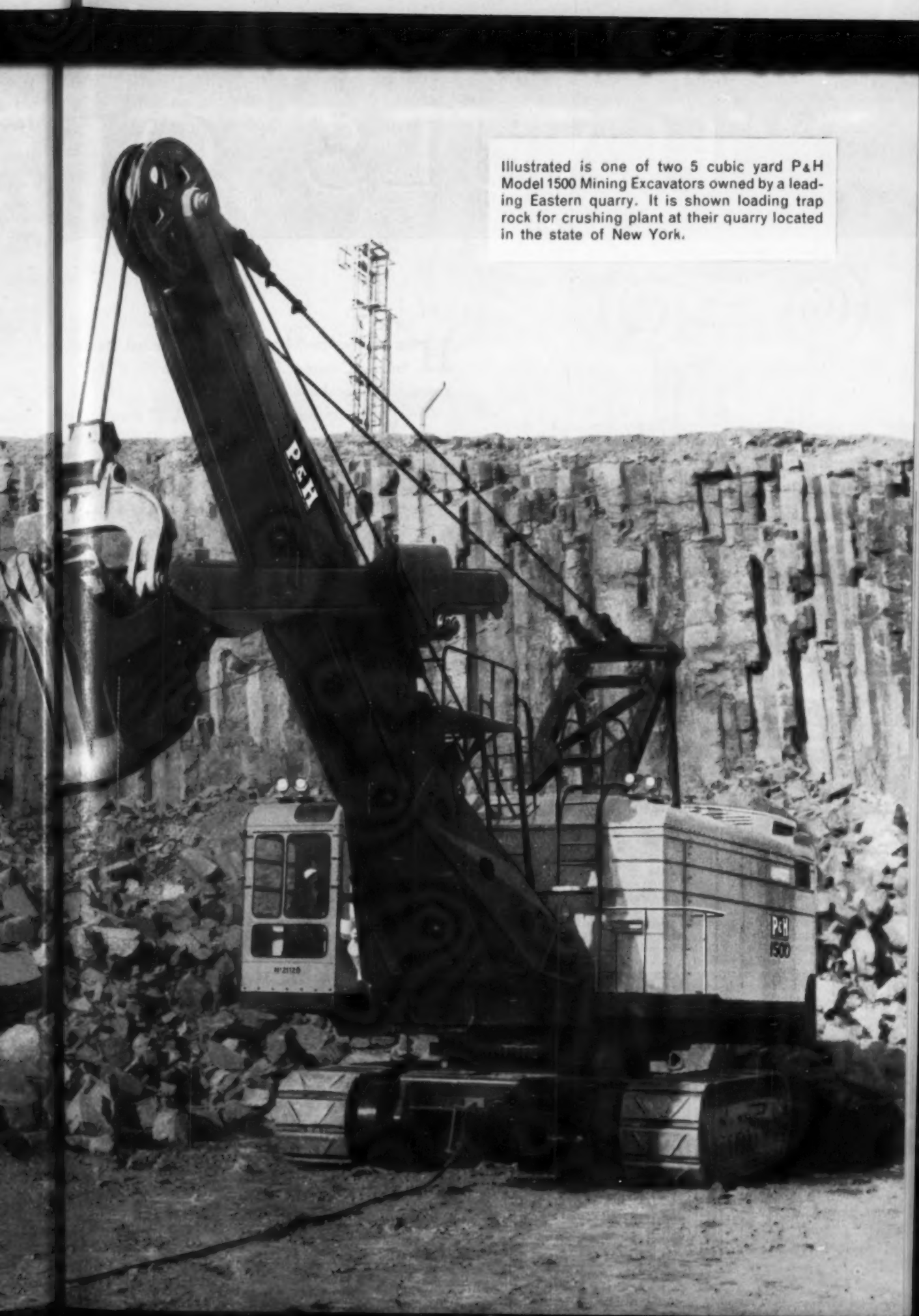
OUR 75TH YEAR

P&H MINING EXCAVATORS

HARNISCHFEGER CORPORATION
Construction & Mining Division
Milwaukee 46, Wisconsin

P&H MINING EXCAVATOR LINE: 3½ through 10 cu. yd. capacities





Illustrated is one of two 5 cubic yard P&H Model 1500 Mining Excavators owned by a leading Eastern quarry. It is shown loading trap rock for crushing plant at their quarry located in the state of New York.

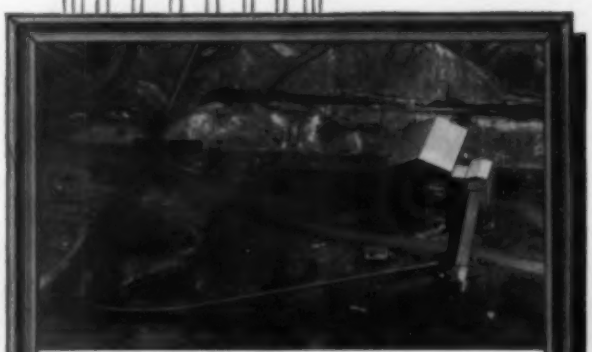
HAULS OF

HERE ARE on-the-job stories of five United States Rubber Conveyor Belts, taken from "U.S." belt records in the coal mining industry.

These belts are just some of the "U.S." standouts which demonstrate, year after year, why "U.S." is the world's largest producer of conveyor belts.

For steady, day-in and day-out dependability in conveyor belting, it always pays you to secure the advantages of "U.S." Engineering. "U.S." Engineers work directly with "U.S." Distributors or original equipment manufacturers to assure their obtaining the right belt recommendations for each type of conveying.

The most comprehensive belting engineering information in the industry is available through your "U.S." Distributor. It will pay you to check with him.



U. S. CONVEYOR BELTS

"A revolution in strip mining," says superintendent, "U.S. Conveyor Belt helps us save $1500 per week."

The Will Scarlet mine near Stonefort, Ill., has an outstandingly successful use of the first overland belt conveyor in a strip mine. The conveyor belt system, using a U. S. Giant® Belt, reduces the number of trucks, eliminates extra roads and high maintenance costs. The belt makes possible economical stockpiling for continuous operation: miners can continue working without a tipple operation—or the tipple can produce without a mining operation. The system can be moved to any location on the 3,000-acre tract. As the pit progresses overland, more lengths are simply added to the belt. "Maintenance costs are very low. Our savings are $1500 per week. We intend to install additional 'U. S.' Belting soon." *Another Three-Way Engineering Triumph.*

"After 20 years, 'U.S.' still gets the replacements," says plant foreman

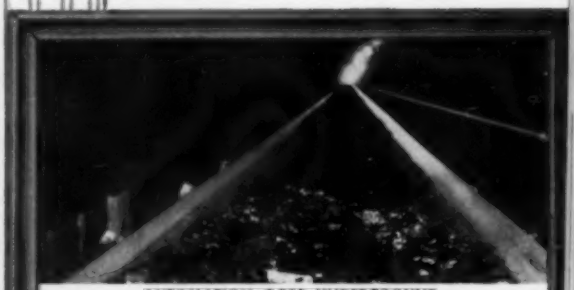
Mr. James Campbell of Guyan-Eagle Coal Co., Kelly, West Va., knows why Guyan-Eagle has been using (and replacing with) "U. S." belts in their 5 mines. In the words of the company's own officials, "U. S." Belts are:

"The most dependable in our experience."
"Resistant to abrasive action of rock."
"Strong, durable—maintenance is minimum."

FAME

40,000,000 tons of washed coal

This is the minimum tonnage expected to be hauled in an estimated 12-year life by the main "U. S." belt. Installed in U. S. Steel's Robena Coal Mine, Uniontown, Pa. Robena is three mines, serviced by the same preparation plant. It is one of the largest coal-producing units in the nation. A single U. S. Rubber slope belt (installed 1953) conveys all the washed coal, amounting to over 20,000 tons a day. An earlier "U. S." Belt (installed in 1951) conveys coal to the blending bins.



AUTOMATION GOES UNDERGROUND

"U. S." Belts help make foolproof the push-button conveyor system in the Dana Slope Mine of Amherst Coal Co., (Rensford, West Va.).

Limited storage capacity, both inside the mine and on the surface, makes it mandatory that this slope conveyor operate without stoppage. So Amherst, knowing the "U. S." reputation for dependability and long life, selected a 42" U. S. Giant 6-ply YN belt. Operating since 1952, it has given completely trouble-free service.

Coal crosses the river on a belt 3870 feet long

Jones & Laughlin preparation plant at La Belle, Pa., is one of the world's largest. Here outputs from Vesta and Shannopin mines are combined.

Coal from the Vesta is carried across the river on a 3870-foot U. S. Rubber Conveyor Belt supported by the world's longest belt conveyor suspension bridge. This belt (actually all the belts in the system are "U.S.") has been operating since 1948 without a breakdown. In these eleven years it has carried a total of 44 million tons so far.

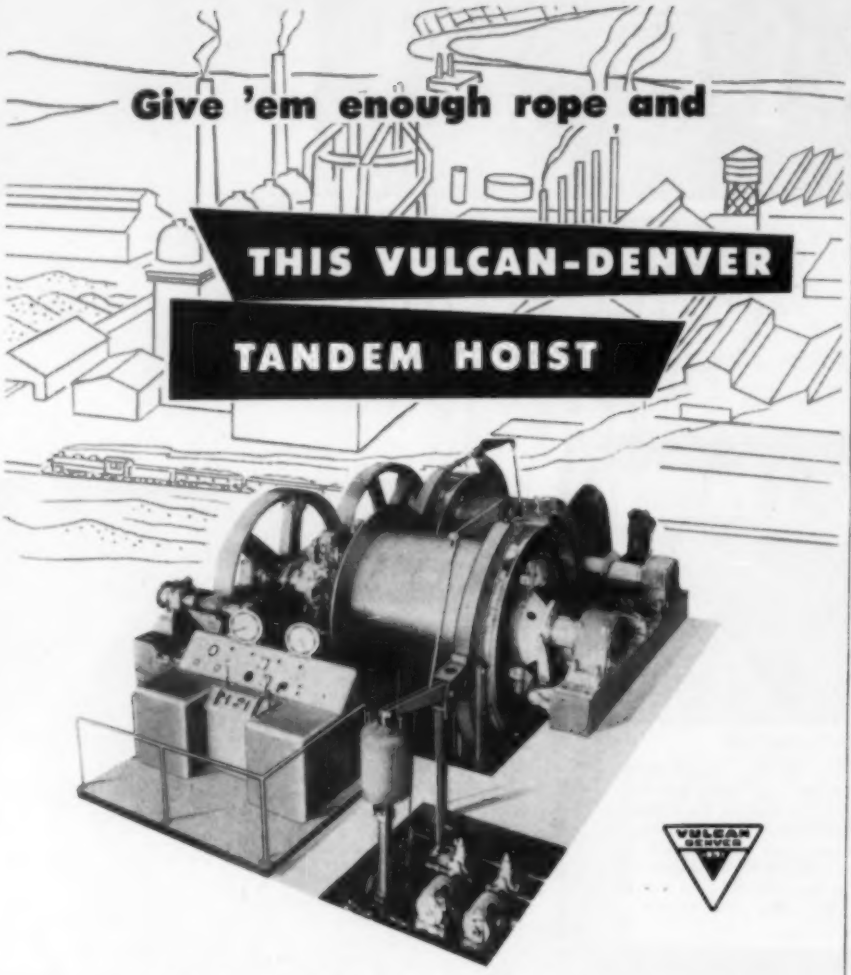
US RUBBER

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.



Hoists like this dual-drive tandem installation have been used both underground and on the surface, for shaft sinking and for production haulage. The dual drive is capable of putting the combined power of both drive motors into either drum for 30,000 lb. of rope pull.

Clutches are radial acting dental type and all principal shaft bearings are anti-friction roller bearing. Vulcan-Denver hoists may be remote controlled or automatic operated without affecting the strength or traditional superior performance.

Name your specifications. Vulcan-Denver builds to your needs from six decades of design experience.

SHEAVES—Of cast steel or Mehanite construction.

CAGES—Car and man cages, safe and easy running; automatic bottom dumping skips and combinations.

ROLLERS—Slope rollers with replaceable rubber or neoprene segments, sealed bearings, for heavy service.

WRITE FOR LITERATURE AND QUOTATION TO YOUR SPECIFICATION

Vulcan
IRON WORKS CO.

IN DENVER SINCE 1891

2960 SOUTH FOX
ENGLEWOOD, COLORADO

Mines, Companies

Sale by the Trotter Coal Co. of three Monongalia, W. Va., mines and other properties to Christopher Coal Co. was announced recently.

R. M. Davis, who has headed the Trotter Co., is retiring after a lengthy career in the coal industry. It is believed that Christopher paid about $175,000 for between 4,000 and 5,000 acres of land. The mines, in Clay, Cass and Grant districts, have been shut down since mid-March and had operated on a reduced schedule for some time prior to that date.

Colorado Fuel & Iron Co.'s Frederick coal mine turned in the best safety record of any coal mine in Colorado during 1958, according to the annual report of the State Coal Mine Inspection Dept.

The mine had a record of 159,040 man-hours worked for every injury. During 1958 the mine, which has an average work force of 445, produced 243,667 tons of coal.

Winners of the National Safety Competition conducted by the United States Bureau of Mines have been notified they will receive the bronze Sentinels of Safety trophy awarded each year by *The Explosives Engineer* magazine to the first place winners in each classification.

Winners of the competition for 1958 are: Germantown Colliery, Raven Run Co., Centralia, Pa. (anthracite); and No. 14 mine, United States Steel Corp., Gary, W. Va., (bituminous).

Green Coal Co., Owensboro, Ky., has bought a 42-cu yd stripping shovel from Bucyrus-Erie Co.

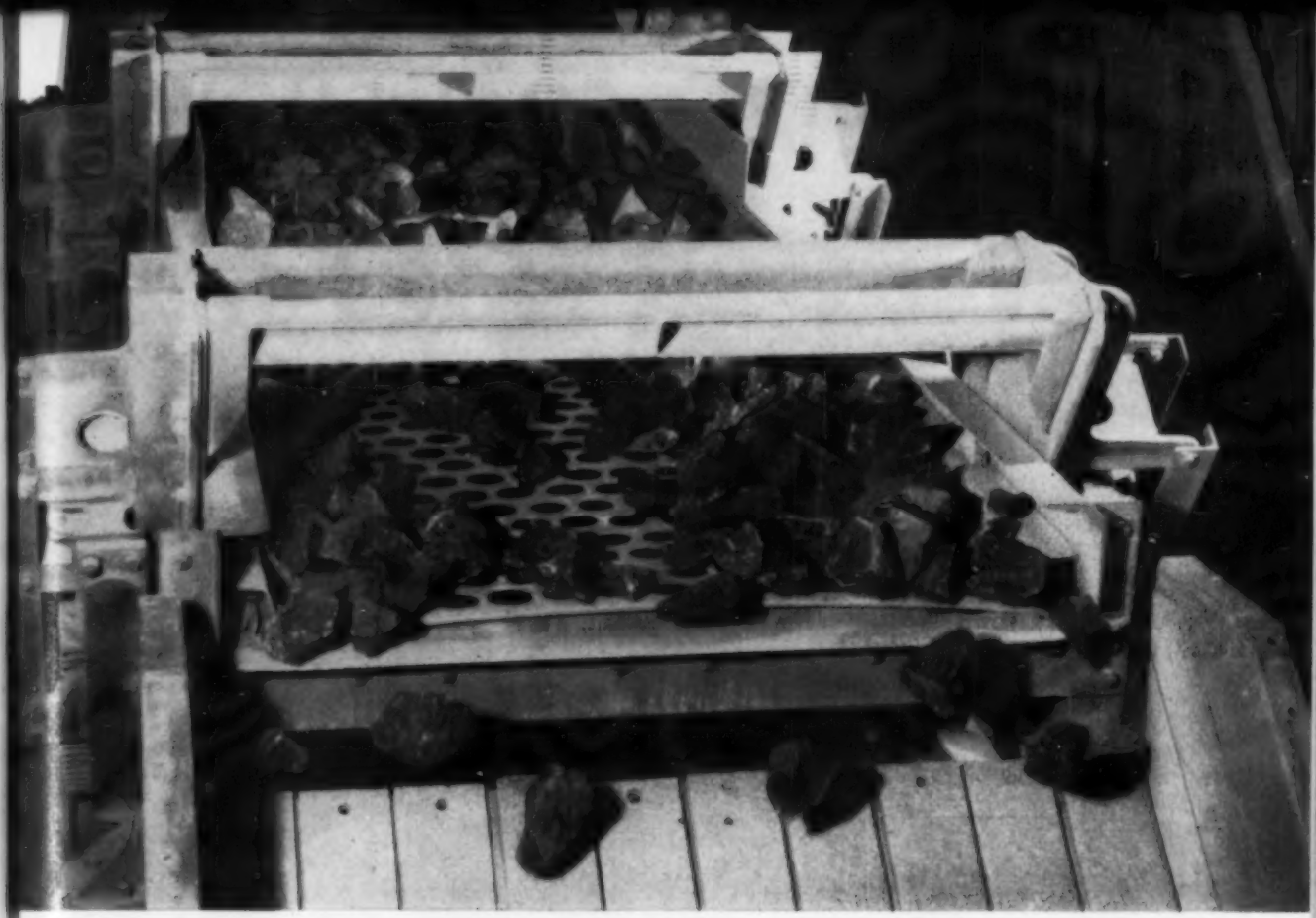
The shovel, a model 1050-B, costing well in excess of $1 million, will be delivered by next September. The machine will dig more than 60 tons of earth and rock in a single bite and cast it 120 ft from the digging point.

The Northwestern Mining & Exchange Co. closed its Kramer coal mine in May because coal reserves were exhausted, according to a report.

Some 140 men were employed in the mine when it closed. Opened in 1920, the mine reached peak production of 1 million tons annually in 1925, at which time it had a work force of 1,300 men.

The abandoned Leyden coal mine, northwest of Arvada, Colo., may be used as a storage place for about 210 million cu ft of natural gas, say reports.

Gas firms in the Denver area believe the mine may be a good spot to keep reserves for peak load days.



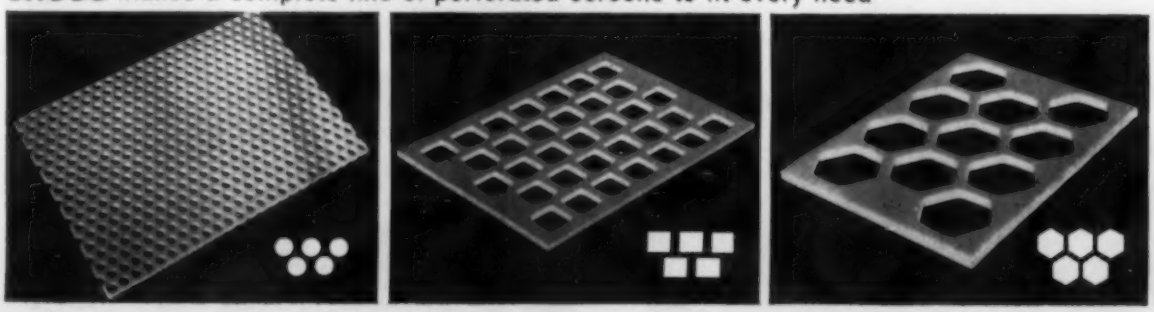
with **CROSS** perforated steel screens . . .

You can save up to 20% on replacement

For many coal screening applications, CROSS Perforated Screens made from high-quality steel can save you as much as 20% on replacement costs. Tests prove that CROSS Perforated Screens have a service life nearly double that of other types of coal screens. And, because CROSS screen plates are manufactured as rigid, one-piece units, there is no problem of stretching or loss of screen tension. You save on down-time costs, too, because screen adjustments and reshaping are eliminated.

CROSS PERFORATED steel screens are available in a wide range of sizes with uniformly spaced square, hexagon or round perforations, staggered for increased capacity and efficiency. For additional information on CROSS Perforated Screens for shakers, vibrators and revolving screens, write CROSS PERFORATED METALS, National-Standard Company, Carbondale, Pa.

CROSS makes a complete line of perforated screens to fit every need



CROSS Perforated Metals

Carbondale, Pa.

NATIONAL NS **STANDARD**

Introduced at the COAL SHOW...

LW-80 HAULPAK®

80 tons

*Trademark HPC-2142-M-2

Now ready to cut your haul costs

of coal at 40 MPH

Brief Facts: 80-ton, 100-cubic yard capacity . . . 450-hp Cummins V-12 diesel engine . . . Allison transmission and torque converter . . . Four forward speeds to 40.1 mph; two reverse to 7.8 mph . . . Ten 18.00-33, 32 PR tires . . . Full time hydraulic power-assist steering . . . 6,552 sq in. of brake surface . . . Approx. 73,000 lb empty weight, 233,000 lb loaded weight.

Most profitable coal hauler ever made . . . the LW-80 moves 80 tons of payload at 40 mph. Apply those figures to your own operations, see what a difference they make on your cost sheets. This outstanding new coal hauler offers these features:

- Exclusive Hydrair* wheel suspension on all wheels
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- Exclusive power-transfer differential
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- Lowest center of gravity for greater stability

If you're ready for MAXIMUM efficiency in your coal handling, see your LW Distributor or write us for full information.

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Will it hold you up or blow you up?

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This hazard is so well recognized that blasting operations are often suspended whenever a thunderstorm is detected.

There is a simple, commonsense method of reducing this lost time while minimizing the hazard of premature shots. Use Primacord as the "down line" to detonate the charges in each hole – and as "trunk lines" to connect all holes.

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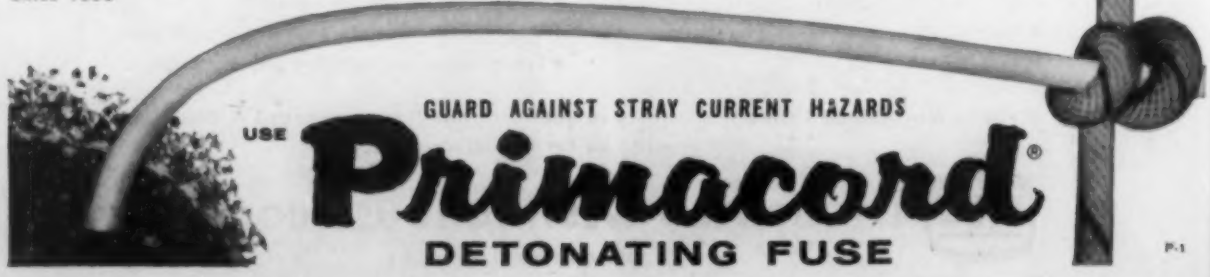
attach fuse and cap or electric blasting cap to the end of your trunk line.
With Primacord, you call the shots!

THE ENSIGN-BICKFORD COMPANY, Simsbury, Connecticut
Since 1836



USE **Primacord®** GUARD AGAINST STRAY CURRENT HAZARDS
DETONATING FUSE

P-1

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

COAL AGE

JUNE, 1959

IVAN A. GIVEN, EDITOR

Parallel Payoff

Where should coal be looking for the biggest return in the future? Should the emphasis be on production and related activities, or should it be on market development in all its phases, including research and public and consumer relations?

The answer is, of course, that each should be accorded the emphasis it is entitled to. If this were the actual situation discussion of the question would be superfluous. Since it isn't—at least yet—there is good reason for the increased activity on the market-development and public-relations fronts, marked, among other things, by the organization and activation of the National Coal Policy Conference.

The fact is that an outstanding production job will not pay off completely and fully unless it is backed up by a good sales and consumer-service job in all its ramifications. Coal over the years has done an outstanding production and preparation job earning, incidentally, the distinction of being about the only major U. S. industry that has held the line against inflationary pressure. Equally significant, it has room to keep the process going for several years to come.

But coal still has not cashed in on its production achievements as it should. The record is still replete with examples of other fuels being chosen when coal obviously is better from the cost, convenience and safety standpoints. Reasons? Among them consider research. Admittedly an enhanced program is essential, because, as summed up by Dr. R. L. Savage, of The North American Coal Corp., at the recent BCR Techno-Sales Conference: "The only risk greater than doing research is not doing it."

Research is the road to performance superiority. But there is more. Research results must be translated into products or programs and actively promoted. Coal, for example, still has done relatively little in promoting the sale, installation and servicing of modern equipment, though it has made a good start. And coal still has done relatively little in developing programs that will back up and reinforce market development. Take the matter of a national fuels policy. The U. S. has none—and will have none unless coal can provide the leadership to an even greater extent than in the past. It is moving to do so.

The job, then, of the moment is to create a market-development approach and organization for coal as powerful and effective as the production setup. As with production, two of the big ingredients are money and talent. The organizations for making such money and talent effective already exist or can be created. Achieving that effectiveness represents an opportunity for coal every bit as big as the opportunity in production.

Skill in coordinating men, machines and methods is the key to company growth and profits. Acquiring the skill means learning . . .

How to Modernize Coal Management

Progressive companies aiming at long-term growth and stability are swinging with new techniques in management practice. Here is a broad look at these techniques . . .

- What they are
- Why they are vital to coal
- How to put them into use

By W. A. Raleigh Jr.,
Associate Editor, Coal Age

IT IS NO LONGER smart business to "fly by the seat of your pants." That's the central fact coming out of a *Coal Age* survey of modern management practice in planning, organizing and operating for maximum profits-return today and tomorrow.

Highlights of the survey show that the core of modernized planning is conscious effort to develop an approach which integrates short- and long-term needs in production, marketing, personnel and finance. Built into the concept is responsiveness to new ideas and methods.

Ruled out is the notion that big companies have a monopoly on the fruits of modernized planning. What makes small companies grow and prosper to bigness is awareness of and continuous adaptation to growth potentials. The habit of planning for growth, once gained, then becomes indispensable to perpetuating it.

Putting modernized planning into action starts by streamlining the existing organization. This means giving adequate recognition to all managerial functions essential to successful mine operation; clearly defining responsibilities and lines of authority; striking a proper balance in staff and line relationships; preparing for growth, flexibility and change; and seeking effective distribution for work loads.

Good management practice also recognizes the compelling need for greater understanding and acceptance of certain operating techniques which are critical to achieving a workable system of managerial development, more scientific attack on cost control and equipment policy, and more effective communications.

Investigation of these techniques brings into focus terminology which is frequently strange-sounding to old timers. One hears talk, for example, of industrial engineering, operations research, measuring profitability, auditing obsolescence, and matching motivation with incentives.

With raised-eyebrow indifference, some veterans, proud of their rugged individualism, will pass off the jargon of modern management practice as so much "gobbledegook."

No parties to such indifference, however, are those who put on and participate in such movements as the Penn State management workshops (p 76), nor the more progressive companies who see in modern management practice the means of solving major problems. Typical among these are:

1. How to keep wage boosts from outstripping increases in productivity.
2. How to gain maximum profits-return from higher investments in labor and equipment.
3. How to stay ahead of competition which is still tough and getting tougher.
4. How to meet the increasing demand for more skilled managerial talent.
5. How to accumulate capital funds for equipment-buying and capacity expansion.

Wherever the concept of modern management practice has penetrated into coal company shops and offices, there has been acceptance that it embodies executive and supervisory skills which are not illusory but identifiable, measurable and learnable.

The following pages take a broad look at these skills and how they can be put to practical use in planning, organizing and operating for growth and stability.

Modernized Planning

The Basic Concept

Regardless of size, every company formally or informally prepares a plan or program to anticipate operational needs. Routine planning involves anticipating short term needs (usually for periods up to a year) in four major areas: production, marketing, personnel and finance. The central factor which converts routine to modernized planning is conscious effort to integrate short-term needs into a long-range plan aiming at growth and stability of profits.

The manager of a small company often clings to the notion that modernized planning is the exclusive province of high-tonnage producers. His attitude might find expression in any one or combination of the following statements:

"We manage to get along as we are."

"We've been doing it this way for years — why should we change?"

"That may be all right for the other fellow but our operation is different."

The notion that big companies have a monopoly on the fruits of modernized planning is purely a defensive attitude which has no basis in fact. Every small company has within it the seeds of bigness; conversely, all big companies were once small.

What makes some small companies grow and prosper to bigness is awareness of and continuous adaptation to growth potentials. The habit of planning for growth, once gained, then becomes vital to perpetuating it.

The components of continuous adaptation to growth potentials will, of course, vary with individual companies. But two staff-reviewed cases, the North American Coal Corp. and the Princess Coal Sales Co., point up certain fairly typical common denominators.

North American's rise to prominence as the ninth largest commercial producer of bituminous coal reflects no magic or miracles. (*Coal Age*, October, 1958, p 79). Rather it shows how careful, long-range management planning can integrate all phases of production and marketing to serve total company growth. To NACCO, this means:

Acquiring properties and introducing equipment which have the greatest cost-reducing and profits-producing potentials.

Coordinating sales development with mine and market locations.

Building a strong reserves position.

Reducing mine-to-market costs.

Expanding working capital.

Improving personnel performance.

Developing new and improved products.

Implementing the broad concept of public relations (i.e., coordinated effort to promote harmonious relations with line and staff personnel, customers, the community, lending institutions, government authorities, etc.).

As with all expansion-minded companies, NACCO realizes there can be no let-down in the pursuit of growth. Its latest move (March, 1959) was a proposed merger with Warner Collieries, Inc., strategically located on

Sixth Workshop in Action . . .

JAMES A. YOUNKINS (right), Duquesne Light Co., is welcomed by workshop staffers, R. B. Hewes, Marcus Davis and Elizabeth Thompson.

AT LECTURE SESSIONS, entire group listens while highly qualified speaker introduces management subject. Topics cover wide range of interest, from "making the labor contract work" to "creative thinking."

Penn State Workshops Pioneer in Management Training for Coal

UPGRADING COAL managerial talent to its full potential is the aim of a series of workshops conducted by the Penn State management training staff and a coal-industry planning committee. The sixth workshop in the past 3 yr was held April 5-10 at the White Sulphur Springs Hotel, Mann's Choice, Bedford County, Pa.

The five-day workshop, planned exclusively for coal, is beamed to all levels of management, from foreman to president. Attendance has drawn heavily on Pennsylvania and West Virginia companies. But representation is spreading as far west as Illinois and no geographical limits are intended.

To reach their objective, workshop planners set up programs which stress authoritative discussion and individual participation. They describe operation of the workshop as follows:

"The topic to be considered is introduced to the entire group through a lecture session by a highly qualified speaker.

"The main group [limited to 35] is then divided into smaller groups of 10 to 15, in which the subject is discussed in still further detail, with each member given an opportunity to participate.

"The principal speaker circulates among the groups during these 'break-up' sessions.

"The entire group then meets again for approximately one-half hour. At this time a representative from each of the small groups presents at least two questions to the speaker. Any

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the Kanawha River. Behind the move: Warner properties offer a prized combination of quality coal, low-cost barge transport and access to new markets.

Experience of the Princess Coal Sales Co., selling subsidiary of Princess Coals Inc., shows how careful, long-range planning can pay off even in a declining market. (Princess Coals, Inc., is the new corporate identity for Princess Elkhorn Coal Co. and Powellton Coal Co. since last December when the parent company also acquired, as subsidiaries, Sycamore Coal Co. and Cinderella Coal Co.).

As described in *Coal Age* (January, 1958, p 70), Princess Coal Sales saw total U.S. sales to the retail market fall from a peak of 125 million tons in 1944 to less than 40 million tons in 1957. Since its formation in the early 1940s, however, PCS has had steady growth averaging about 15% annually. Key components of the growth: continuing market analysis, production of quality coal tailored to consumer needs, and total selling and engineering service offered to an extensive network of some 2,000 retailers in six states and several provinces of Canada.

Responsiveness to New Ideas

Built into the concept of modernized planning is responsiveness to new ideas and methods. It is possible to "get by" through complacency or by stubbornly adhering to the traditional or proven way of doing things. But modern managers recognize that constant alertness to opportunities for improvement is critical to reducing production costs, market development and top personnel performance. Consider, for example, the following cases reviewed by *Coal Age*.

Continuous updating of methods and machines, coupled with outstanding training and employee relations programs, have been major factors in boosting productivity at **Peck's Run Coal Co.**, Buckhannon, W. Va. Output per man (excluding supervisory and clerical personnel) rose to 19.3 tons last year from 6.9 tons in 1917 and 12.6 tons in 1949 (October, 1958, p 92).

Skillful planning and development of **Alabama By-Products Corp's.** Maxine Mine, Maxine, Ala., enabled a smooth three-fold expansion of output from 588,000 to 1,584,000 tons within a year (May, 1957, p 85).

Design and fabrication of tapered split-wedge clamp for large rope on

AT SMALLER BREAKUP SESSIONS, individual participants give and take in detailed discussion of subject. Informal exchange of ideas and experience opens the mind and heart; can be a great stimulus to doing a better job.

participant may contribute to the discussion.

"The evening sessions are devoted to panel discussion, film forums, role-playing and other demonstration methods."

During the past 3 yr, subjects featured and discussed have included defining the management function, improving management performance, effective communications, personnel selection and training, discipline through training, the foreman's job as a manager, motivating the front-line supervisor, getting people to work efficiently, creative thinking, making better decisions, making the labor contract work, and how to conduct a meeting.

Workshop planners measure the effectiveness of their programs primarily by industry response. This has justified continuance of the workshop series for 3 yr so far, on a twice-a-year basis. Last fall, requests for attendance at the fifth workshop exceeded the 35-person limit. This was reason enough, the planning committee decided, to repeat the fifth workshop program this spring.

Developing response, of course, goes much deeper. For one thing, workshop men have found the single industry workshop promotes greater community of interest from the outset, thus cutting down unproductive time.

Most fundamental also is to make all participants feel they have benefited from attendance. Accordingly, every workshop program has built-in progress controls. Each group, for example, defines, and assesses attainment of, its own objectives. Evaluation sheets permit all participants to rate the effectiveness of each speaker and each day's program. Suggestions for future programs are invited.

Especially useful is a loose-leaf workshop kit which provides a convenient package for reference on all workshop papers and proceedings. The kit also explains how to get the most out of a conference; the roles of participant, observer and consultant; and suggestions for note-taking.

Coordinating the workshop are Dr. O. H. Tribble, Robert B. Hewes and Marcus K. Davis—all of the management training staff, Penn State Mineral Industries Extension.

The industry planning or workshop committee includes:

Richard H. Jamison Jr., Delmont Fuel Co.

David H. Davis, Consolidation Coal Co.

Charles B. Tillson Jr., Crucible Steel Co. of America

James Younkins, Duquesne Light Co.

John N. Crichton, Johnstown Coal & Coke Co.

Homer B. Chalfont, Bethlehem Mines Corp.

John J. Snure, Rochester & Pittsburgh Coal Co.

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its Mountaineer shovel, enabled **Hanna Coal Co.**, Cadiz, Ohio, (1) to cut downtime caused by hoist ropes slipping or breaking at clamps, and (2) to boost shovel range and output through a 5-ft increase in dumping height (June, 1958, p 88).

An 18-mo shop training program for new recruits cut downtime and built a reserve of potential maintenance for **Stonega Coke & Coal Co.** (January, 1958, p 100).

A new concept in underground conveyor design, brought these gains to **Peabody Coal Co.**, St. Louis, Mo.: faster belt extensions, lower maintenance costs, less supply-line traffic and greater flexibility in mining (February, 1958, p 124).

Development of the "make-your-own" stripping explosive, Akremite, halved the cost of charging blastholes for **Maumee Collieries,** Terre Haute, Ind. (May, 1955, p 71).

The opening of new research facilities by **Consolidation Coal Co.** at Library, Pa. (April, 1958, p 68) and by **Island Creek Coal Co.** at Holden, W. Va. (March, 1959, p 42) gave new stress to research as a sales tool for developing current and future markets.

The organization of the **Pocahontas Industrial Council for Education** set a workable pattern for breaking the bottleneck of technical manpower shortages in the Bluefield, W. Va. area (November, 1957, p 54).

The formation in February of the **National Coal Policy Conference** initiated a new campaign to attack industry problems through a "common voice" representing all coal groups and allied industry interests (April, 1959, p 28).

These are but a few of many cases that could be cited to show how open-mindeness can trigger achievement.

Streamlining the Organization

Putting modernized planning into action is not as complex as it may sound. It does not require setting up two distinct plans—one to serve immediate and the other, long-range needs. Neither does it require—at least in initial phases—the addition of new personnel. Rather the implemen-

Recommended Reading

FOR THOSE wanting to expand their knowledge of what makes modern management tick, the following are recommended reading:

Management and Organization, Louis A. Allen, McGraw-Hill Book Co., N. Y. C.

Developing Executive Skills, American Management Association, N. Y. C.

The Management Team, E. C. Bursk, Harvard University Press, Cambridge, Mass.

Effective Supervision, Milon Brown, Macmillan Co., N. Y. C.

Is Anybody Listening?, William H. Whyte, Jr., Simon & Shuster, N. Y. C.

Mining Guidebook, Coal Age, Mid-July, 1958, McGraw-Hill Publishing Co., N. Y. C.

Various articles, *Factory,* McGraw-Hill Publishing Co., N. Y. C.:

7 Tips in Updating Management (January, 1959)

12 Hazards in Organizing (June, 1957)

Management Development (December, 1957)

Latest Word in Profitability (January, 1958)

Fastest Way to Figure Whether to Buy That New Machine (January, 1957)

How to Audit Obsolescence (November, 1958)

How To Make a Maintenance Audit (August, 1958)

tation starts by streamlining the existing organization structure. This means:

1. Identifying and giving adequate recognition to all managerial functions essential to successful mine operation.
2. Clearly defining responsibilities and lines of authority.
3. Striking a proper balance in staff and line relationships.
4. Preparing for growth, flexibility and change.
5. Seeking an effective distribution of work loads.

Identifying Functions

Giving adequate recognition to all managerial functions requires first that each be identified. Then follow with a grouping of related activities into job units, carefully adapted to the size and objectives of the total operation. The primary managerial functions and major subdivisions of each are as follows:

I Managing the Company

Overall policy—production, marketing, personnel, finance
Overall performance—planning, organizing, directing, coordinating, controlling
Labor negotiations
Legal matters
Public relations

II Managing Production

Methods, planning, mine layout
Underground and strip mining, haulage, etc.
Preparation
Coordination with sales
Quality standards and control
Equipment—needs, maintenance, evaluation
Safety, roof control, ventilation, etc.
Power supply and distribution
Drainage, pollution control, reclamation

III Managing Marketing

Sales—contract negotiations
Sales—planning, market analysis, promotion
Coordination with production
Customer relations
Shipping

IV Managing Personnel

Procurement
Training
Employee relations, grievances, etc.
Compensation, fringe benefits, etc.
Performance evaluation

V Managing Finance

Capital expenditures
Capital development
Cost control and budgeting
Purchasing, inventory control, records, etc.
Accounting and payroll

Grouping related activities into specific managerial units usually takes the form of the conventional organization chart—an array of assorted rectangles drawn together by vertical and horizontal lines. The common tendency is to approach such charts mechanically. Frequently heard is the remark: "Well, yes, we have one but nobody ever uses it."

In fact, however, the rectangle chart can be desirable, useful and meaningful if it is designed to fulfill the basic purpose of organization, i.e., to establish relationships that will enable people to work effectively together toward common objectives.

Defining Responsibilities

For relationships to be effective, each member of the management team—from the face boss to the president—must have a clear concept of how he fits into the total scheme of things.

He should know exactly what his job is and why he's doing it.

He should know to whom he must report.

He should know to whom he can go for decisions and advice.

He should know to whom he should give information that might aid the job objectives of others.

He should have a working knowledge of company policies and aims.

Within the framework of organization structure, overlapping of responsibilities is unavoidable. Unless the operation is very small, major work-activity areas—new methods and equipment analysis, maintenance, personnel, cost control, etc.—are too big and basic for confinement. Continuous participation and contribution by the total management team is a must.

The responsibility for cost control, for example, goes up and down the line; it varies only in degree. The general foreman or mine superintendent may have certain cost goals. To achieve these, however, he must depend heavily on the performance of his section foremen, maintenance bosses, and other supervisors. Similarly, top management is effective in laying down company cost goals only when all subordinate managers accept a full share of responsibility for their achievement.

Staff and Line Relationship

Managers must be aware of the need for overlapping responsibilities. But they must also recognize that control of the overlapping is mandatory. One key factor here is to seek a clear line of demarcation between staff and line personnel. Possible exception is in the small company where the cohesiveness of the man-

agement group provides automatic checks and balances.

Generally, line personnel are held accountable for attaining end results or primary objectives; staff personnel for providing specialized assistance and common services essential to line objectives. By making this distinction, management sets up a control device to identify the responsibilities of each in contributing to total performance.

One particular word of caution. Be careful not to isolate staff and line from each other. For best results, a close working arrangement between the two is vital. Staff should maintain periodic contact with line to keep abreast of line problems; line should regularly go to staff for advice and consultation. Where actively and continuously practiced, a happy staff-line relationship becomes a most convenient and valuable tool for problem-solving.

Preparing for Change

Another facet of controlling responsibility—preparing for change—enters the picture as a company grows and diversifies.

If a company has been operating under a functional type organization, where groups of related activities are centered under one management unit, it must weigh the merits of changing to divisional structure. If a company is already divisionalized, expansion or curtailment of the existing organization may be in order. An integral part of both situations is the need to evaluate centralization vs decentralization of authority.

In considering changes to the organization structure, Louis A. Allen, director, organization planning, Booz, Allen & Hamilton, suggests the following guideposts:

1. Clear up confusion about what divisionalization and decentralization mean.

"Much of the confusion can be eliminated if we differentiate clearly between decentralization and divisionalization. The two are closely related, but a company can be divisionalized and not decentralized and vice versa.

"Decentralization is the systematic and consistent delegation of authority to the operating levels of the organization not to be confused with situations where maintenance, engineering, purchasing and other groups service geographically separated locations under headquarters authority . . .

"Divisionalization, on the other hand, is the process of breaking large functional departments into divisions grouped in terms of either product or geography."

2. Be alert to the need for change to divisionalized structure. "The first signs are usually excessive decentralization, delays in decision-making, difficulties in coordination between functions, managerial deficiencies [shortages in managerial talent], and difficulties in establishing controls."

3. Approach divisionalization as "a radical dismemberment of the existing structure. Administrative preparation for divisionalization should include a full measure of decentralization to vitalize the management of the divisionalized units.

"Adequate management talent must be developed or recruited to staff the organization.

"Increased capital costs and administrative costs must be anticipated.

"Provision must be made for the coordination of the separate divisions and an adequate control system must be developed.

"Above all, the company planning to divisionalize must provide adequate time for the change to be consumated."

4. Seek to balance decentralization by an appropriate measure of centralization. "The central management authority must make overall decisions in planning, organizing, motivating, coordinating, and controlling if the decentralized operating units are to proceed with the necessary conformity and coordination toward a common goal."

5. Keep the objectives of decentralization always in mind. It "should always be undertaken to ease the burden on top company executives, to facilitate diversification, to provide product and market emphasis, to encourage the development of managers, and to improve motivation."

Effective Distribution of Work

Consider why some refer to effective distribution of work as one of the most important and difficult management skills. The task is important because it is critical to developing the full potentials of the management team. The task is difficult because maximum achievement is never final and at best elusive.

One aspect of the job focuses on top management's skill in matching the individual's abilities and personality to his job; another on the individual's talents in practicing the art of delegating authority.

Skill in matching men to responsibilities begins in the screening, selection and training of personnel. It is directly related to how well a company handles the four previously described essentials of the "streamlined organization." It also crops out in what a company offers in the way of incentives, recognition, salary, and opportunities for advancement.

A frequent pitfall is expecting supervisors to put in up to 18 hr a day, or to be on call around-the-clock. Although management may not have originally intended such, a re-examination of the responsibility might uncover faults in organization structure.

Bear in mind, it's false economy to have one good man regularly doing the work of two. The situation often builds up resentments, saps physical, mental and spiritual energies, and leads to this result. The job gets done but the extra 10% of effort—the priceless ingredient that stimulates initiative, cost-saving ideas and other intangibles of top performance—is lost.

Excessive work or responsibility are not always due to faults in management structure. Equally important is the ability of the individual supervisor or manager to practice the art of delegating authority. Here, if management has done its job of defining overall goals and responsibilities, the individual is largely on his own.

Foremost, he must take personal stock of his psychological and emotional approach to his job.

Is he, for example, afraid to let go of details?

Does he think it will reflect discredit on himself if a subordinate can do as good or a better job than himself?

Does he lack real faith in the ability of his subordinates?

Does he feel that he must continually check subordinates to see they are doing their jobs?

Positive answers to these questions suggest personal deficiencies in job approach. By correcting such defi-

ciencies, the individual manager makes the first step toward effective practice of the art of delegating authority.

Key components of pursuing the art should then include:

1. Devising an incentives plan that will motivate subordinates to highest productivity.

2. Requiring subordinates to take full charge of job assignments, subject only to approvals at critical development points.

3. Setting up a communications climate which permits necessary but not excessive amounts of guidance, appraisal, training, and exchanges of ideas and information.

Critical Operating Techniques

The mark of a successful company is long-range continuity of maximum profits-return. Modernized planning and organization are basic to the achievement. But there is increasing recognition of a compelling need for wider use of certain operating techniques which are critical to achieving a workable system of managerial development, scientific attack on cost control and equipment policy, and more effective communications. In this broad look at opportunities to increase management skills, it would be presumptious to attempt full coverage of these subjects. But some definition of their meaning and value is pertinent.

Managerial Development

Before setting up a workable system for developing managerial talent, company planners should first stop and ponder the question: "What makes an effective manager?" Definitions vary but effectiveness boils down to ability to reach established goals through guiding and directing the work of subordinates.

Thus it is possible for a man to be highly capable at his particular level of management activity but fall flat on his face when it comes to managing subordinates in the next higher managerial bracket.

Once this distinction is made, the answer to effective management development takes shape. In short, create a growth climate within the total management structure that will enable subordinates at one level of management to grow in the experience and ability required at the next higher level. Stated otherwise, the individual manager becomes the focal point for training his replacement or for developing managers of equivalent responsibility.

Toward this end, the individual manager's approach to developing managerial talent should continuously include:

1. Practicing the art of delegating authority as previously defined.

2. Taking a personal interest in each subordinate's training, performance and advancement.

3. Making each subordinate feel his job is important.

4. Seeking to establish a relationship of high mutual trust.

5. Providing maximum freedom to subordinates in carrying out their job assignments.

6. Accepting each subordinate as an individual without requiring him to conform to the performance pattern of predecessors.

7. Setting high performance standards and expecting appropriate results.

8. Viewing mistakes as opportunities to promote improvement.

When a climate for managerial development is established, a powerful incentive pattern is put to work. Almost certain to follow are major gains in upgrading and perpetuating the quality of managerial performance.

Comprehensive Cost Control

The term "industrial engineering" is used to identify and categorize all elements essential to positive, continuous and complete cost control effort.

"In its broadest form," *Coal Age* pointed out (April, 1958, p, 78), "industrial engineering includes the indoctrination of top management in control techniques, the addition of industrial engineering to the management setup, the participation of operating management and supervisors, the use of time studies for improving methods and setting standards, the adoption of production incentives, and the setting up of control machinery, including expenditure budgets.

"The rewards of a good industrial engineering approach to operating are impressive, with several organizations reporting cuts of 25% or more in direct mining cost, and up to 50%, in a few instances, in face cost.

"Cost control through industrial engineering is based upon measuring actual cost against potential costs, rather than actual costs against those of the past. Thus, it is basically the most realistic approach, since it starts with a carefully established yardstick and ends with a production and cost control budget providing final control. . . ."

Operations research might be defined as an advanced or extended form of industrial engineering. Through mathematical techniques, "O.R." seeks to solve a wider range of management problems which are frequently tougher because they embrace more variables and more complex relationships.

Typical problems might involve setting up production schedules to suit varying demands; designing plants for maximum efficiency; analyzing bottlenecks; evaluating processing systems; simplifying record-keeping tasks; determining how much to spend on employee benefits and incentives plans; fixing quality standards; and timing the purchase of materials, machinery and equipment.

One authority pinpoints the importance of operations research as follows:

"For years, you've had many of the problems that operations research is able to tackle. And you've been solving these problems, too. But your solutions have not always been as good as you would like them to be.

"Today, competition and high labor and materials costs are forcing you to get better answers to stay in business. Operations research tries to find better ways of getting maximum returns from the dollars you spend. It's another kit of tools you'll want to use in the never-ending struggle for more efficient operations."

Systematizing Equipment Policy

The terms "measuring profitability" and "technological obsolescence audit" describe phases of modern management's effort to systematize

the timing, selection and financing of new machines, equipment and processes. Object of the effort is to ensure investment payoff in modernization programs.

The "latest word in profitability is replaciation," states *Factory* (January, 1958), a McGraw-Hill publication specializing in the plant management and maintenance field. "It's a new way to figure the future of equipment investment—and a sure, simple guide to better decisions on machine replacement."

Replaciation gains its meaning and value when compared to depreciation as a means of estimating the profitability of new equipment proposal. Over a period of years, depreciation write-off is usually not enough to cover high replacement costs due to progressive price inflation and possible new features added to a given process or piece of equipment. Replaciation, on the other hand, is a more realistic approach because it anticipates these factors by including appropriate amounts in the selling price of products and services.

"The newest approach to technological obsolecense audit is based on the performance of functions and services required to turn out the right quality and quantity of a product in the time available." *Factory* (November, 1958), pegs this technique as "a compromise between the extremes of a complete systems analysis and a simple review of new models of equipment now in use.

"The key point in auditing on the basis of functions and services required (preferably by studying engineering drawings and operations sheets) is that it provides an effective means of checking process or methods obsolescence as well as equipment obsolescence."

Technological audit does not take the place of direct economic analysis or of the various methods used in calculating the rate of return on an investment. Its major role is to provide the means of selecting modernization proposals which offer the greatest potentials from an operating point of view.

Preventive maintenance rates top priority in any equipment policy aimed at ensuring investment payoff. In its modern context, preventive maintenance of machines and equipment starts with proper design and installation. It then becomes a regular function of the production cycle providing:

1. Periodic servicing to meet normal upkeep needs.
2. Periodic inspection to uncover conditions which might cause breakdowns or harmful depreciation.
3. Facilities and skilled labor for immediate repair of breakdowns when they occur.

Important to remember, top management and maintenance supervisory personnel must think out and plan a preventive maintenance program and clearly define responsibilities for its implementation. Conscientiously pursued, modern preventive maintenance brings substantial rewards in increasing productivity, extending the life of machines and equipment, and in upgrading trade-in values.

Effective Communications

Of all the management skills, ability to achieve effective communications is the most basic. It is the force, continuously in operation, which translates all other skills into smooth functioning parts of the total company operation. Edward C. Bursk, in *The Management Team* puts it this way:

"Delegation and control are the principal functions for the development of the greatest potential effectiveness of the management team. And freer communication must be achieved before extensive delegation and control becomes possible. Knowing how to delegate, how to exercise control and how to achieve freer communication are essential skills of the executive."

For a communicative system to be effective, understand:

1. That the main purpose of communications is to achieve a full meeting of the minds between all parties whose job functions are vital to the attainment of established company or departmental goals.
2. That there must be two-way communication up and down the organizational pyramid with free access by all individuals to appropriate supervisory authorities.
3. That the means of communication—the spoken or written word, the visual aid, etc.—must be geared to the interest and comprehension of the audience.
4. That reaching another person's mind commonly involves the need to adapt to, or compromise with, deep-rooted prejudices, stubbornness and language deficiencies.
5. That the fine art of listening should be consciously cultivated.
6. That publications—bulletins, annual reports, memos, posters, etc.—have their place but never substitute for personal contact in many situations.

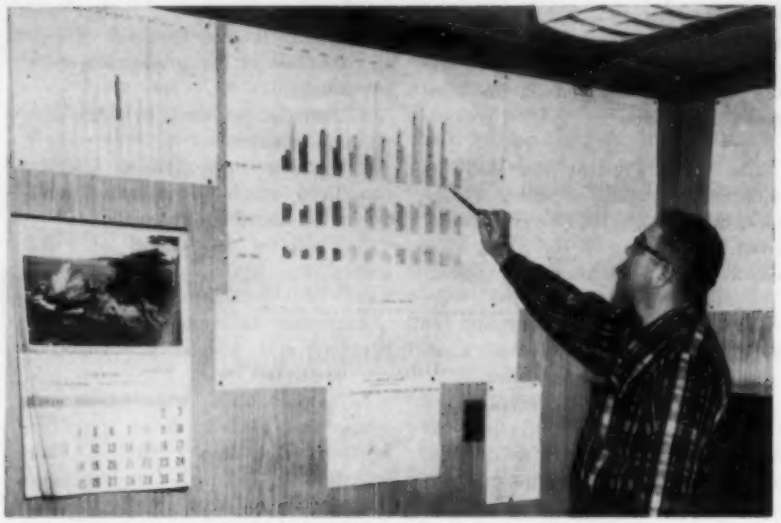
Admittedly these guideposts are an oversimplification of what is needed to make communications effective. However, once implemented and continuously followed by the total managerial force, they will contribute greatly to making communications come to life as a vital tool for promoting top personnel performance. They will also find particularly valuable application in problem-solving, getting better discipline, overcoming resistance to new methods and machines, getting better understanding of company policies, and in reducing complaints and grievances.

The Ultimate Goal: Integrated Management

Historically, coal has been informal, highly individualistic and inclined to a short-term outlook in its management approach. Now however, with rising costs a near-sure bet to follow on all levels in the years ahead, with increasing use of higher cost equipment requiring greater operating and maintenance skills, with tough competition still much in the picture, it is no longer smart business to "fly by the seat of your pants." The most progressive companies are basing their prospects for growth and stability on long-term planning and studious adaptation to modern trends in management thinking.

Integrated, streamlined management is the ultimate or overriding goal—integrated in the sense of a smooth coordination of all company operations to serve common objectives; streamlined in the sense of continual policing of management and operating practices to minimize waste in labor and equipment use, and to ensure maximum use of modern management techniques.

CARL ROGERS, Georgetown maintenance superintendent, directs program.



COST CHARTS, in Mr. Rogers' office, show month-by-month expenditures for major maintenance items and help keep mine supervisors aware of costs.

Planned Maintenance Doubles

Doubled life for diesel engines is typical result of adherence to scheduled maintenance program backed by top management. Cooperation between maintenance and operating personnel, skilled mechanics, adequate tools and facilities provide foundation for successful program.

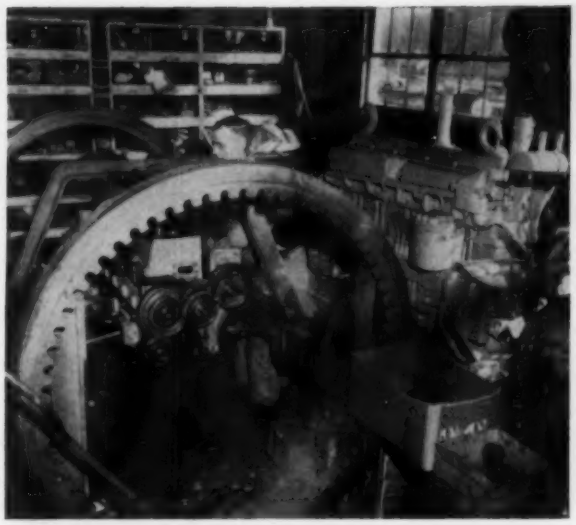
STRICT ADHERENCE to a scheduled maintenance program is paying off at Hanna Coal's giant Georgetown strip mine. A typical result of the program is doubled life for diesel engines. For example, big 400-hp V-12 diesel engines on 18 of Georgetown's 50-ton coal haulers are expected to operate 20,000 hr before overhaul. And at worst the company gets 8,000 hr of life from its older, less powerful engines. This, Hanna management reports, is double the life on most on-highway diesels operating under much more favorable conditions.

Carl Rogers, Georgetown maintenance superintendent, says there are six major keys to the success of the

CHECKING parts with a magnetic flux unit before reassembling engine eliminates chance of defective part being used.

HYDRAULIC components of equipment are rebuilt and tested by specialists in another section of Georgetown shop.

TRUCK ENGINES are rebuilt in special rooms at shop. Harry Horton, (center), shop foreman, supervises rebuild work.



TRACTOR ENGINES also are rebuilt in separate room. Revolving engine support eases reassembly of engine components.

Engine Life, Reduces Downtime

maintenance program. He lists them as follows:

1. Top management wants a preventive maintenance program. Since top management believes in and is enthusiastic about preventive maintenance, mine management, too, boosts the maintenance program.

2. Space and tools are provided to enable maintenance men to do a good job.

3. Maintenance men are trained for their jobs. Hanna does the training job by sending men to manufacturers' schools and by conducting its own training program on company property. Mr. Rogers emphasizes that training must be a continuing program so that men can keep up with new advances in diesel engines. This continuing training is especially important because engines and machines are becoming more and more complex and consequently are more difficult to maintain.

4. Machine operators are chosen carefully and are trained to operate their machines properly. A skillful operator has a lot to do with how much maintenance a machine requires.

5. Maintenance men and operating men cooperate. Mr. Rogers gets cooperation at Georgetown by taking time to explain to operating supervisors and machine operators why certain procedures are necessary. He finds that once the operating men know why a certain procedure is followed they cooperate fully.

6. Maintenance men have the authority to stop a machine any time they feel it necessary. But they are reasonable in exercising that authority.

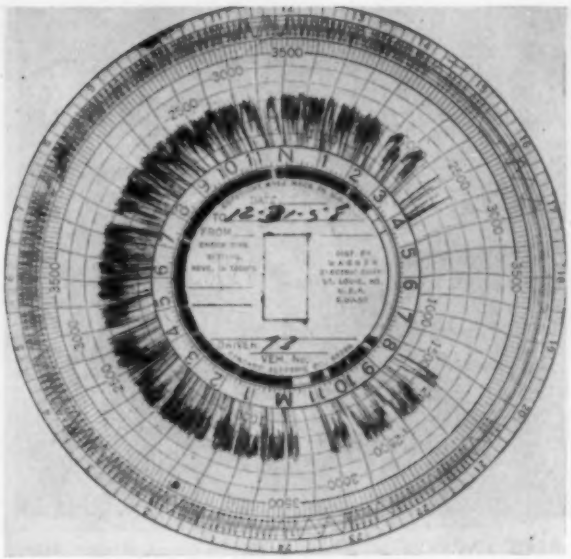
With these six points as a basis for preventive maintenance, Hanna maintenance men are able to keep downtime and materials costs to a minimum.

COMPLETE rebuilding of company trucks from the frame up is another service provided at Georgetown shop. Rebuilding takes place in special area.

Cleanliness Helps

Keeping dirt out of engines is emphasized as one way to prolong their lives. Such dirt catchers as funnels and oil buckets are never used to transfer lubricants to machines and are never seen around lubricants.

To eliminate contamination, all oils and greases are delivered to the



RECORDING tachometer in each truck cab provides a daily chart of engine speed, helps keep overspeeding to a minimum. A typical chart for a 24-hr period is shown at right. Charts are sent to office for checking.

SPECIAL TRUCK carries oils and greases in original drums to equipment.

DRY-TYPE air filter, now being used experimentally, is more efficient.

CONVENIENT drums of lubricants and individual pumps and reeled hoses are conveniently located along wall of truck garage to provide clean products.

field in the original drums in a special enclosed truck equipped with air-powered lubricant pumps. Each drum of lubricant has its own pump and dispensing hose which are used to transfer the lubricant to the machine. By handling lubricants this way, Georgetown management says that there is less possibility of accidentally adding dirt with the fresh lubricant.

Other rules designed to keep dirt out of engines are:

1. Making sure that the oil-filler pipe is clean before adding oil.

2. Inspecting valves and fuel injectors every 300 to 500 hr, depending on the type and age of the engine.

3. Changing engine oil every 125 to 225 hr, again depending on the type and age of the engine.

4. Changing oil filters every time the oil is changed.

5. Using oversize oil filters on nearly all units.

As an added precaution, the oil-bath air filter not only is serviced every time oil is changed but the inside of the air-inlet tube also is thoroughly cleaned. If the inlet tube is not cleaned dirt accumulates inside and restricts the flow of air to the engine, and combustion efficiency decreases.

To further improve the purity of the air entering the engines, the company is experimenting with dry-type

HAULAGE TRUCK DELAY REPORT

Date _____

Check No. _____ Driver _____ Truck No. _____

Shift Worked From _____ To _____

From _____ Pit to Gen. Prep. Plant _____ Trips — Speedometer Reading End Shift _____

From _____ Pit to Gen. Prep. Plant _____ Trips — Speedometer Reading Start Shift _____

From _____ Pit _____ Trips — Total Miles Traveled _____

MAINTENANCE DELAYS		MINUTES DELAYED EACH TIME	TOTAL DELAY TIME
TRACTOR UNIT			
Motor	01		
Radiator	02		
Starting Motor	03		
Clutch	04		
Transmission	05		
Front Axle	06		
Brakes	07		
Drive Line	08		
Electrical System	09		
Battery	10		
Tires (front)	11		
Tires (rear)	12		
Springs	13		
Frame–Cab	14		
Hydraulic System	15		
Greasing System	16		
Lubrication	17		
Motor Oil, Filters–Fueling	18		
Cleanup	19		
Rear Axle	20		
Other Maintenance Delays	21		
TOTAL MAINTENANCE	DELAY		
TRAILER UNIT			
Axle	22		
Brakes	23		
Tires	24		
Springs	25		
Frame	26		
Lubrication	27		
Cable	28		
Hopper	29		
Hopper Doors	30		
Air System	31		
Other Maintenance Delays	32		
TOTAL MAINTENANCE	DELAY		
NON-MAINTENANCE DELAYS			
Loader Broke Down	33		
Waiting for Truck Ahead to be Loaded	34		
Delay at Tipple	35		
Other Non-Maintenance Delays	36		
TOTAL NON-MAINTENANCE	DELAY		

Truck No. _____ **LIST REPAIRS NEEDED**

Driver _____

Special forms are useful in keeping close control over truck maintenance costs.

HANNA COAL COMPANY

Division of Pittsburgh Consolidation Coal Company

PAGE 1

TRACTOR AND TRAILER UNITS _____ Mine _____, 195__ & Year to Date

	MAINTENANCE COST			YEAR-TO-DATE MAINT. COST		
TRACTORS:	Labor	Supplies	Delays	Labor	Supplies	Delays
Motor						
Radiator						
Starting Motor						
Clutch						
Transmission						
Front Axel						
Brakes						
Drive Line						
Electrical System						
Battery						
Tires (Front)						
Tires (Rear)						
Springs						
Frame–Cab						
Hydraulic System						
Steering System						
Greasing System						
Auxiliary Equipment						
Painting						
Lubrication						
Antifreeze						
Motor Oil						
Cleanup						
Rear Axle						
Check & Fuel Trucks						
Filters						
Other						
TOTAL						
TRAILERS:						
Axle						
Brakes						
Tires						
Springs						
Frame						
Lubrication						
Cable						
Hopper						
Hopper Doors						
Air System						
Other						
TOTAL						
NON-MAINTENANCE:						
Loader Broke Down						
Waiting for Truck Ahead to be loaded						
Delay at Tipple						
Other						
TOTAL						
Maintenance Labor						
Maintenance Supplies						
Operating Labor						
Operating Supplies						
Depreciation						
Supervision						
Vacation Pay						
Labor Burden						
TOTAL						

PAGE 2

TRACTOR AND TRAILER UNITS _____ Mine _____, 195__ & Year to Date

Total Tons Hauled:	Month	Year to Date
Raw Coal From _____ Pit to _____		
Raw Coal From _____ Pit to _____		
NUMBER OF TRIPS:		
_____ Pit to _____		
_____ Pit to _____		
NUMBER OF MILES		
_____ Pit to _____		
_____ Pit to _____		
Miles/Trip		
Tons/Trip		
Ton Miles		
Cost/Ton		
Cost/Mile		
Cost/Ton/Mile		
Hours Delayed		
Hours Operated		
Hours Scheduled		
Percentage of Scheduled Hours Delayed		
Percentage of Scheduled Hours Operated		

* Summary of Overspeeds on Georgetown No. 12 Mine

HAULAGE TRUCKS

Truck No.	1st Shift	2nd Shift	3rd Shift	Total
65	–	–	–	–
66	–	–	–	–
67	–	–	–	–
68	0	1	0	1
69	0	6	11	17
70	0	0	0	0
71	–	–	–	–
72	0	0	0	0
73	1	0	0	1
74	–	–	–	–
75	0	0	0	0
76	7	6	6	19
77	39	20	32	91
78	0	0	0	0
79	–	–	–	–
TOTAL	47	33	49	129

* From an analysis of tachometer charts.
Date: January 5th, 1959
1-6-9: ac

DAILY REPORTS on maintenance and non-maintenance delays, details of maintenance costs, work done by trucks and any truck overspeeding provide management with valuable information of equipment performance.

replaceable air filters. Georgetown maintenance men report that the dry filter not only is 15 to 20% more efficient but also admits air to the engine easier. For example, negative or suction air pressure on the air inlet is only 5 to 6 psi when the dry-type filter is used, whereas it is 16 psi when the oil-bath unit is employed. The benefit of the lower pressure is that more air enters the engine with less effort. Consequently, there are fewer combustion problems.

Although the initial cost of the dry-type filter is more than an oil-bath unit it does not have to be replaced as frequently. Hanna maintenance men stress that it is important to handle the dry-type filter carefully during installation to avoid puncturing it. A hole destroys the effectiveness of the unit.

Oil Analysis Pays

Hanna relies on chemical analyses to arrive at a safe number of operating hours between oil changes. Over a number of years the company has been gathering information about the quality of oil after it has been used for various lengths of time. Each time the oil is changed a sample of the drained oil is sent to the company laboratory where tests are run to determine the water, acid and sulphur contents, as well as viscosity.

Tests results and key information about the engine are recorded for each analyses and are added to the previously obtained data. The general information is used to arrive at a safe number of operating hours for all engines, whether new or old. The company realizes that the number of hours established as a standard may be too low for new engines, but at the same time notes that the benefits of clean oil more than offset the cost of the more-frequent oil changes.

To keep an accurate record of engine operating time, Hanna equips each machine with an electric hour meter. The meter not only serves as a guide in making oil changes but also in checking valves and injectors every 300 to 500 hr.

Some of Hanna's diesel engines are fitted with turbochargers, which also are given special attention. Every 500 hr the turbocharger is washed out with a solution of household detergent and water.

The cleaning job is done without removing the turbocharger from the engine. First the inlet and outlet pipes are disconnected from the turbocharger. Then a flexible hose is connected to each of these openings. The two loose ends of the hoses lead to a bucket of cleaning solution. When the engine is started the exhaust drives the turbocharger which in turn circulates the cleaning solution. It takes 10 to 15 min for the turbocharger to clean itself.

Cleaning the turbochargers prevents buildup of carbon on the turbine blades. Hanna maintenance men point out that if the turbochargers are not washed regularly the carbon deposits build up. Then as the carbon layer gets thicker chunks of it are thrown off, the rotor becomes unbalanced, starts to vibrate, destroys the bearings and eventually shakes itself apart.

Starters and generators also are included in the Georgetown engine maintenance program. Every time a truck pulls into the garage for a scheduled oil change, the covers are taken off the starter and generator and the dust is blown out of the interior with compressed air. This simple procedure has virtually eliminated failures of these two units, which cost about $700 each.

Georgetown No. 12 Mine Maintenance Supervisors

Carl Rogers, general maintenance supervisor
Leo Inskeep, general inspection supervisor, heavy equipment
William Wasko, master mechanic
Harry Horton, shop foreman
Sherman Deaton, shop foreman, repair garage
Lloyd Hartley, chief electrician
Joseph Schumacher, welding foreman
Harold McMannis, welding foreman
James Michelli, welding foreman
Charles E. Piatt, field maintenance foreman

Rebuilding Engines

Two special rooms in Hanna's shop are set aside for engine rebuilding. One is used exclusively for truck engines and the other for tractor engines. All engines are torn down and rebuilt by specialists.

As soon as an engine is dismantled the engine block is soaked in a hot cleaning compound that removes all varnishes and deposits. After the block is pulled out of the solution cylinder bore is checked before rebuilding starts. Then the inside of the block is painted with special crankcase sealer.

Before the engine is assembled both old and new parts are tested with a magnetic flux unit to detect any invisible cracks or defects. A used crankshaft gets a double checking—one before it goes to the machine shop to be turned down and again when it is ready for installation. The company double checks because some cracks do not show up until after a crankshaft is turned. Hanna management says that considerable money is saved by reusing the crankshafts after they have been double checked. Savings are twofold: first, the cost of a new shaft that many companies automatically install when rebuilding an engine; second, elimination of the possibility of a defective shaft being put back in an engine and then failing shortly after the rebuilt unit goes back into service.

Preventing Engine Abuse

In addition to regular inspection and maintenance of engines, Hanna maintenance men insist that truck engines be operated at normal speeds. Overspeeding, Mr. Rogers notes, is a major way a diesel engine can be damaged. Hence, the company takes precautions to keep overspeeding to a minimum. Each truck has its own recording tachometer device which makes a continuous 24-hr graph of engine RPM's.

Charts covering each 24-hr period for each truck are sent to the mine office where the number of overspeeds per shift are recorded on a master sheet listing all trucks. Copies of the daily master sheet are sent to Mr. Rogers and operating supervisors, who can spot in a glance if any trucks are overspeeding. Field supervisors then discuss any overspeeding with the driver of each truck, taking care to emphasize and explain why overspeeding is harmful to engines. For example, foremen explain that bearings, valves, crankshafts and so on are designed to work

at certain maximum speeds and when these are exceeded the parts are likely to fail.

The recording device also has a warning indicator that lights automatically when the engine speed exceeds the maximum recommended value, thus alerting the driver to the overspeed. Hanna has used the recording tachometers for 12 yr and reports that they are a basic tool in prolonging engine life.

All trucks have governors but they do not control truck speed on a downhill grade. It is this tendency to overspeed when traveling loaded on down grade that Hanna watches closely with the recording units.

If any of the metering devices, such as the recording tachometer, hour meter, or odometer, do not function the truck is taken out of service until the unit is repaired.

Premium Fuel Helps Performance

Aside from carrying out a program of scheduled preventive maintenance, Hanna pays careful attention to fuel combustion, noting that if fuel is not burned efficiently more acids and other harmful compounds find their way into the crankcase. To keep this type of contamination to a minimum fuel systems are constantly checked. In addition, Hanna uses a premium all-weather diesel fuel. This fuel is a better-refined product costing 1 to 1½c more than regular fuel but the company says that the difference is more than offset by the following advantages:

1. Flows better in subzero weather.
2. Has lower sulphur content.
3. Contains fewer impurities.
4. Is consistent in quality.
5. Is not as dry as regular fuel; consequently, there are fewer fuel pump and injector troubles.

Maintenance Meetings

Regular maintenance planning meetings enable Hanna to keep a running record of maintenance costs. Mine superintendents and the heads of the various maintenance divisions meet each week to review the list of parts purchased that week. Any unusual expenditures come under close scrutiny and ways of eliminating them or cutting them down are developed. Planning maintenance jobs for the following week also holds an important place in the weekly meetings. The operating supervisors also learn what materials were used in the previous week.

On the 10th of every month maintenance and operating supervisors meet to go over maintenance costs for the previous month. Figures are checked not only against those for the previous month but also for preceding months of the year.

At the beginning of each year all supervisors in the maintenance department meet to review maintenance costs for the previous year and work out a budget for the new year. Each division, such as, large shovels or rolling equipment, sets up its own estimate of labor and materials for the coming year. These estimates then serve as a guide throughout the year and are used at the weekly and monthly meetings.

As a constant reminder to himself, other maintenance men and operating officials, Mr. Rogers keeps 10 separate cost diagrams posted in his office. Each chart is a running account of a major maintenance cost item. For example, charts are made for the following maintenance items:

1. Maintenance supplies, haulage trucks.
2. Tire cost, per mile and per ton.
3. Cost of oil, grease and waste.
4. Haulage cost, per mile, per ton and per ton-mile.
5. Maintenance cost per ton, for labor and materials.
6. Total wages, bullgang, in total dollars and overtime.
7. Total wages, garages.
8. Total cost, tractors.
9. Total cost, supply truck.
10. Total cost, individual pickup trucks.

The charts not only serve as constant reminders of maintenance costs but also highlight any unusual expenditures or trend in costs.

Maintenance Personnel

Hanna's Georgetown maintenance staff is made up of 88 men, including 25 welders; 16 bullgang men servicing six giant stripping shovels; 24 men headquartering at the main garage; and 23 men working at the Quonset building. These men are supervised by eight foremen who report to Mr. Rogers. The Georgetown maintenance staff is responsible for maintaining all stripping shovels, overburden drills, trucks, tractors, graders and air compressors.

Diesel maintenance and bulldozer rebuilding are handled by the 23 men at the Quonset building and 24 men at the main garage. These 47 men are responsible for 162 pieces of diesel-powered equipment which must be serviced regularly according to company standards. Included in the diesel-powered units are 26 50-ton coal haulers, 25 enddump trucks, 75 crawler tractors, 6 motor graders, 10 small coal-loading shovels, 6 air compressors, and 14 highway trucks.

COMING IN A SINGLE PACKAGE:

The July issue of Coal Age and 1959 Mining Guidebook and Buying Directory

NEXT MONTH readers of Coal Age will receive their annual issue of the Coal Age Mining Guidebook and Buying Directory. This is an issue you will find useful throughout the year, as a reference book on up-to-date mining practices and equipment, and as a source of information on names and locations of manufacturers of equipment you need.

Within the covers of the next issue you will also find the regular July issue, complete with feature articles of interest to executives and supervisors, and all regular departments, such as the Editorial, News Roundup, Coal Commentator, Foremen's Forum, Operating Ideas and Equipment Developments, as usual.

another

DORRCO FLUOSOLIDS COAL DRYING SYSTEM

Now on stream at

INLAND STEEL...

Another large Dorrco FluoSolids coal drying system was recently put in operation at the Inland Steel Company's new coal drying plant at Price, Kentucky.

Currently, the system is removing 22.0 tons of water per hour from a wet feed of 180 tons per hour of ⅝" x 0 metallurgical coal.

These statistics, however, show only a partial story, for FluoSolids coal drying, when compared with conventional thermal drying techniques, is proving commercially to provide higher efficiency, higher capacity, closer operating control with lower maintenance.

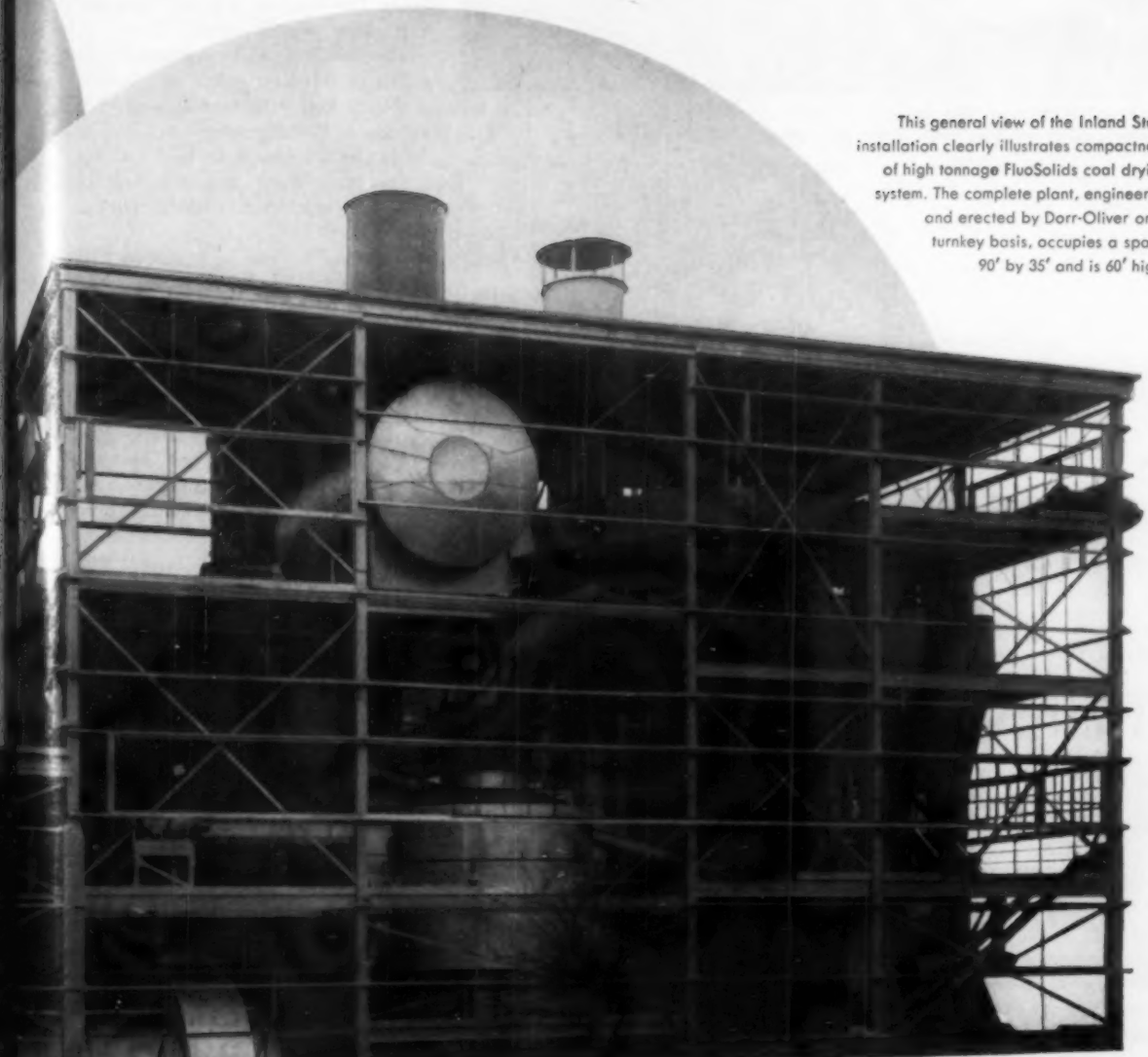
Operating data substantiating these facts are available. For the complete Dorrco FluoSolids coal drying story . . . and more significantly how application of the system can benefit your plant operation, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

What is the FluoSolids System?

A VALUABLE TOOL FOR DRYING, SIZING AND HEAT TREATMENT

When particles are suspended in an upwardly moving stream of gas, the entire dense mass behaves much like a liquid and is said to be fluidized. Applied to coal drying by the Dorrco FluoSolids system, fluidization results in a new and better drying technique, in which the efficient mixing action of the fluidized bed instantaneously transfers the heat from preheated air to the wet coal. A combination of reactor, blower, cyclones and other auxiliary equipment forms a complete processing system, adaptable to a wide range of drying, sizing, roasting and heat treatment applications.

HELP FOR YOUR PROBLEM: The science of fluidized coal drying was pioneered by Dorr-Oliver. The benefits of this vast experience can be profitably applied in your plant. If you will send us a brief outline of your problem, we will be glad to have an engineer call at your plant for further discussion.

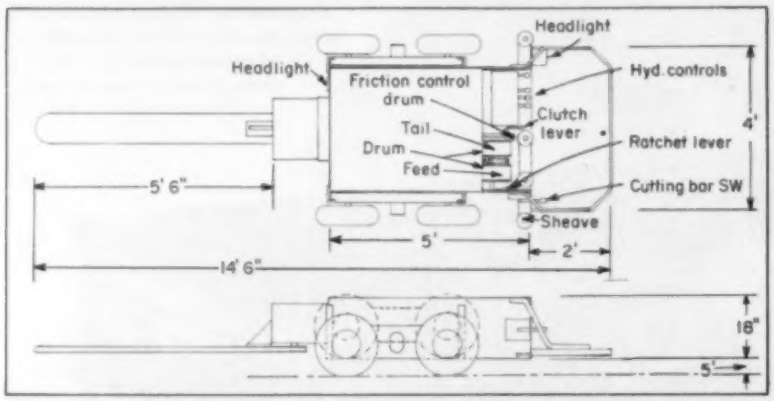


This general view of the Inland Steel installation clearly illustrates compactness of high tonnage FluoSolids coal drying system. The complete plant, engineered and erected by Dorr-Oliver on a turnkey basis, occupies a space 90′ by 35′ and is 60′ high.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U. S. A.

Dorrco and FluoSolids are trademarks of Dorr-Oliver Incorporated. Reg. U. S. Pat. Off.

LATEST ADDITION to the list of equipment designed for truck-mine operations is the new cutting machine (above) which features hydraulic tramming and steering.



DETAILED DRAWING of machine shows dimensions and location of controls.

"Truck-Mine" — Designed Cutting Machine Boosts

Efficiency in Low Seams

New cutting machine developed especially for truck mines in seams as low as 24 in increases production, cuts cost.

MANEUVERABILITY, low operating and maintenance costs, and high-speed cutting are outstanding features of a new cutting machine developed by Kersey Mfg. Co., Bluefield, Va. The machine, which enables truck-mine operators to choose from a variety of power sources—230-V single-phase AC, 230-V three-phase AC, 250-V DC and storage-battery current—also adds flexibility to mining methods and increases efficiency of other mine equipment.

The Ford Coal Co., Grundy, Va., was one of the first truck-mine properties to place the cutter in operation. Dewey Fletcher and Arthur Cook, mine owners, note: "The machine crew cuts an average of 13 places per shift. This is in addition to other work performed by the three-man crew, including setting safety posts, drilling and shooting, and various odd jobs. If the machine operator was permitted to do nothing but cut coal he could average 15 places daily."

Previously, coal was shot off the solid. This practice consumed large quantities of powder which increased the cost per ton of coal produced. Now that the coal is undercut, blasting is achieved by drilling three holes and charging each with 1½ sticks of powder. The savings in powder cost for 1 yr will pay for the machine at this mine.

Special features of the self-propelled bottom cutter include hydraulically powered tandem wheels which can be raised by hydraulic jacks so that the machine rests on the bottom while cutting. When moving from place to place the wheels are lowered, thus raising the machine 5 in for tramming at speeds up to 3 mph, forward or reverse. Steering also is hydraulic. These features elimate dragging the machine to each place or using auxiliary transfer equipment. Tramming height is 23 in, cutting height is 18. The front and rear of the machine are equipped with 125-V sealed-beam lights. The machine is 14½ ft long and 4 ft wide overall.

The machine can be equipped with a 5½- or 6-ft-long cutter bar making a 3⅜-in kerf. Throwaway type bits are used. Cutting speed is rated at 20 in per minute. Both feed and tail drums are "live," and the tailrope drum is equipped with a friction brake.

The machine can be equipped with a 15-hp single-phase AC motor, 15-hp three-phase AC motor or 15-hp DC motor. The 15-hp single-phase motor is designed especially for this machine to minimize power demands during starting and when cutting is extremely hard. A standard 15-hp single-phase motor would impose too heavy a demand on the power company's and operator's distribution systems. Therefore, a standard motor could not be used.

Mining Operation

Other Kersey equipment employed by Ford in mining the 30-in-high Widow Kennedy seam consists of a Model HT8 mine tractor and 5 Model 60 coal cars.

The six-heading system is used for main entries and panels. Headings are driven 22 ft wide on 65-ft centers. Normally, one section unit works the main headings and the other drives panels. At present, only the headings are being worked. The section crew consists of nine men, including one motorman, three face preparation men and five hand loaders.

Top is generally bad and requires three safety posts during cutting and loading. The bottom is soft but does not require special attention to permit the tractor to haul coal. A tractor pulls three cars per trip. It takes approximately 8 min to complete a round trip with a haulage distance of 1,200 ft.

The mine works one shift daily and produces approximately 100 tons from the one section. Another section will be added in the near future to increase tonnage. The cutting machine will cut coal for both sections.

Bethlehem Shaft Ropes at the O'Donnell No. 1—This headframe is at the O'Donnell No. 1 Mine, Four States, W. Va.—a high-quality steam coal operation of Rochester & Pittsburgh Coal Co., Indiana, Pa. The man-hoist rope, now in its eleventh year of service, is 1⅜ in. 6 x 27 Type H flattened strand Form-Set, improved plow steel, lang lay, fibre core. The materials-hoist rope is 1½ in. 6 x 27 Type H flattened strand Form-Set, improved plow steel, lang lay, fibre core. The cage has left-lay and right-lay hoist ropes to counteract any tendency of the cage to twist in the guide supports. The Bethlehem rope in this application is demonstrating the strength, endurance, and toughness for which it is well known.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem wire rope

BETHLEHEM STEEL

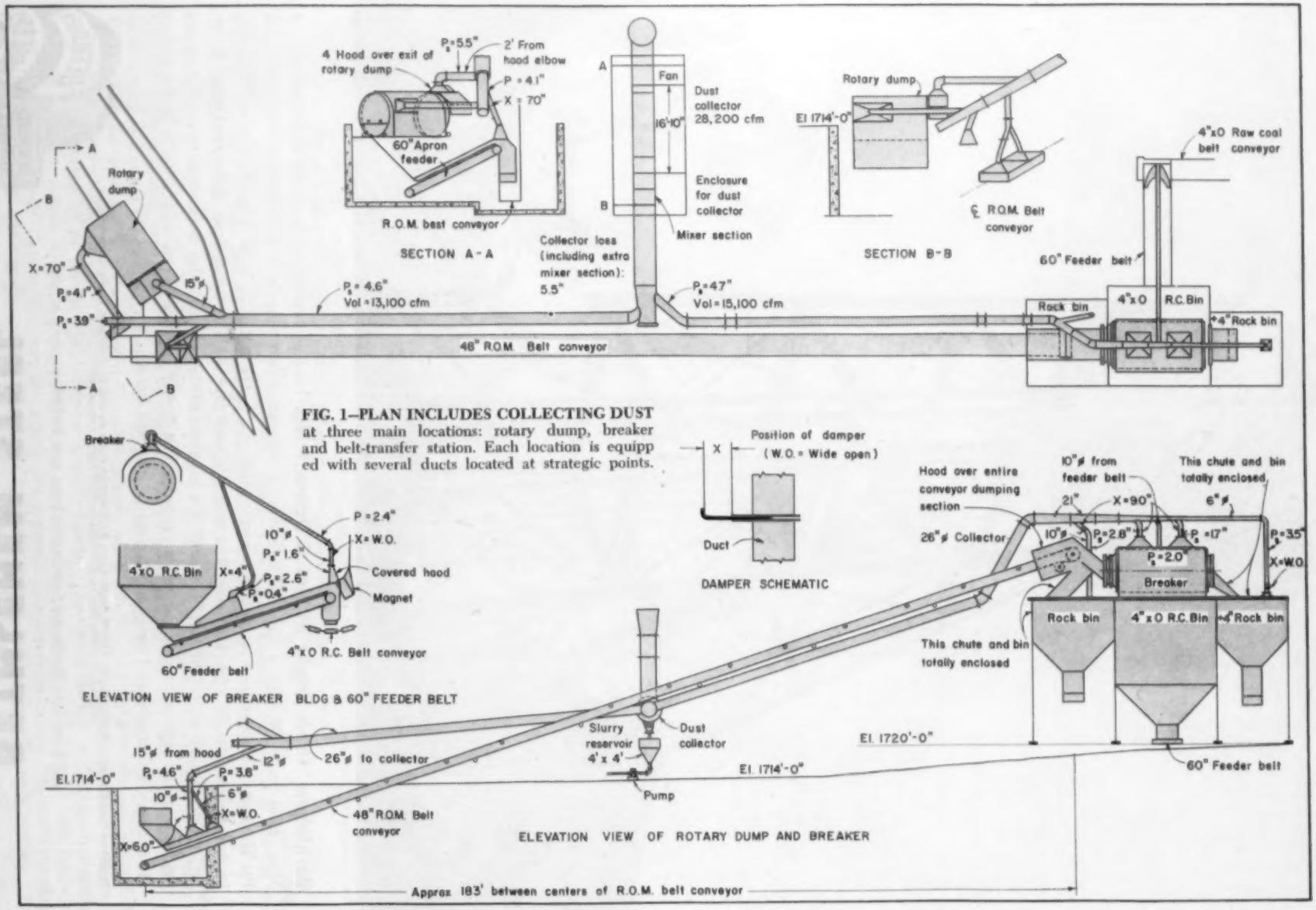
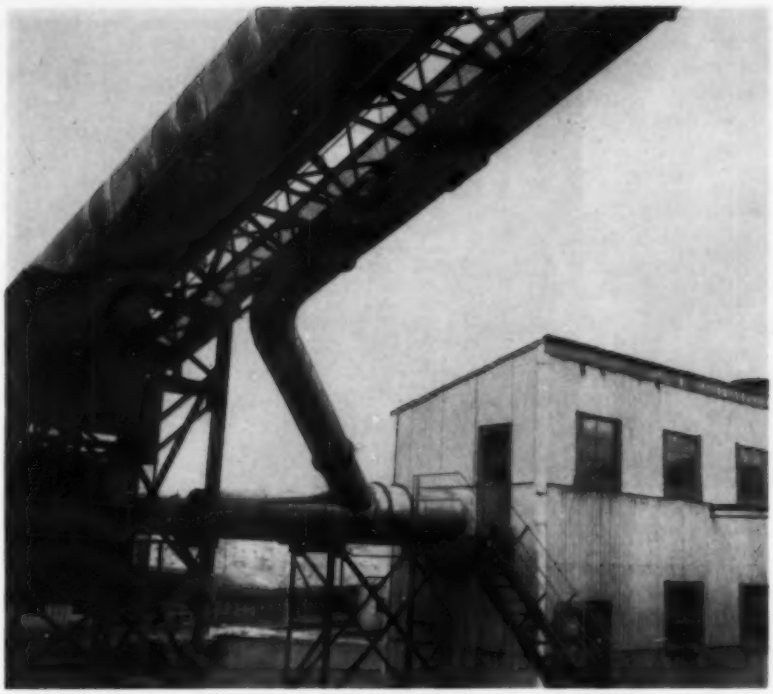


FIG. 1—PLAN INCLUDES COLLECTING DUST at three main locations: rotary dump, breaker and belt-transfer station. Each location is equipped with several ducts located at strategic points.



COLLECTOR UNIT AND SLURRY SUMP are protected against freezing in a steam-heated building. Stainless steel ducts are used throughout the installation.

Better Dust Collection With a Packaged Unit

Reproducing a hurricane inside a relatively small unit has resulted in an efficient and economical dust collector. Here's how Bethlehem's No. 31 preparation plant uses it.

By **C. S. Cressman**, Chief Engineer, Coal Div., Bethlehem Mines Corp., Johnstown, Pa.

And **J. C. White**, Division Superintendent, Cambria Div., Bethlehem Mines Corp., Ebensburg, Pa.

A NEW WET-TYPE DUST-COLLECTOR INSTALLATION at the preparation plant of Mine No. 31, Bethlehem Mines Corp., Nanty Glo, Pa., has improved working conditions, promoted good housekeeping and safety, reduced man-hour requirements for clean-up work and lowered maintenance costs. In addition, it has received "silent" approval from the citizens of nearby Nanty Glo.

Company officials as well as workers were concerned with the surface dust problem at No. 31 from the health, safety and housekeeping points-of-view. Residents of the community also voiced occasional complaints—especially on washdays.

Bethlehem's recognition of the need for corrective measures resulted in the installation of the dust-collecting system strictly from the standpoint of achieving the benefits previously listed. The installation and operating cost could not be offset by recovering collected dust since there would not be sufficient material collected to warrant any expenditure for recovery equipment. So this possibility was ruled out.

Operational Briefs

Coal from Mine No. 31 is brought to the surface in mine cars via a slope track. The cars are placed on a sidetrack for dumping and then are returned to the mine. Formerly, they were taken up an incline plane by a chain-haul and dumped directly into a hopper in the plant. Empties were then returned to the bottom by another chain-haul on the same plane.

Several years ago Bethlehem decided to replace the chain-haul with a belt conveyor to handle coal from the sidetrack to the cleaning plant. The new installation included a rotary dump and breaker to reject rock and size coal. Coal is now transported from the rotary dump to the breaker and from the breaker to the cleaning plant by belt conveyors. The new coal-handling facilities eliminated slate pickers and a crusher. It did, however, add several coal-transfer points. Since the coal at Mine No. 31 is friable, there were times when these areas became quite dusty, even though water sprays were employed to allay dust.

A study of the various types of dust-collecting systems indicated that the new wet-type collector would fit into the limited space available for the installation, was relatively easy to install, required less water than other wet-type collectors and would do the job effectively. Installation and operating cost also favored this system.

Installation Features

A choice was possible between a dual- or single-unit installation. The widespread locations of the dust-origin points (see Fig. 1) at first resulted in favoring the dual unit. However, further study indicated that the single-unit system was preferable because:

1. The disposition of sludge would be much easier since it would be deposited at one point.

2. The space available for the dust collector would enable it to be located in the pneumatic center.

3. The cost of a single-unit system would be considerably less.

4. At no time would either unit

LOCATION of dust-collector unit (left) is in the pneumatic center of the cardumping and breaker dust-origin points.

ROTARY DUMP is equipped with three intake points: two at the dump and one where coal is fed into belt conveyor.

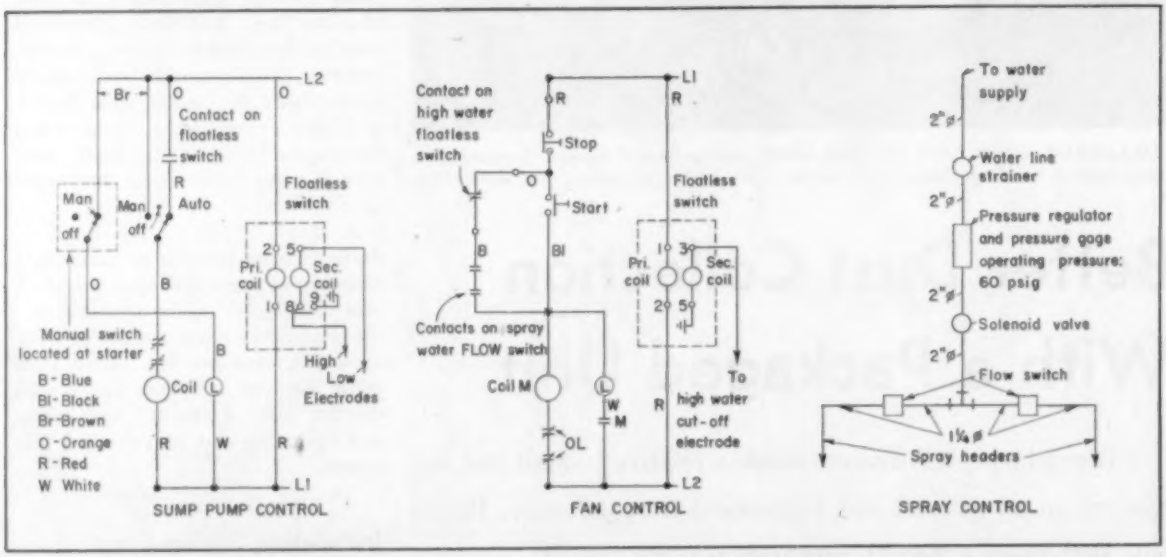


FIG. 2—DUST COLLECTOR spray pump, fan and sump pump diagrams show simplicity of controls.

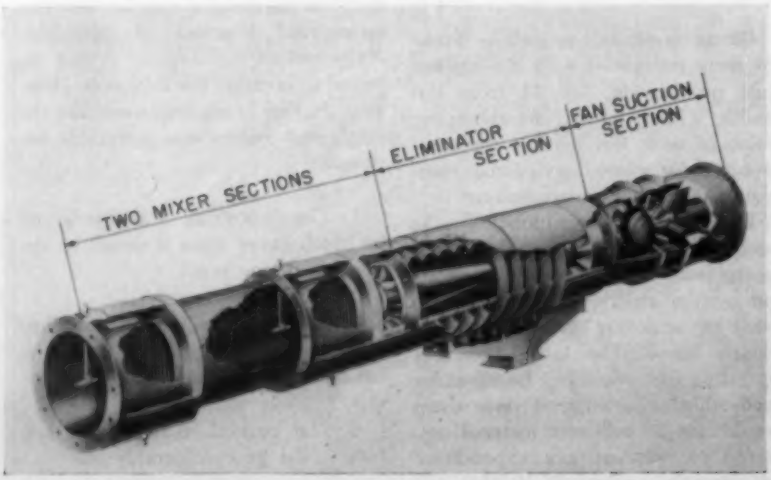
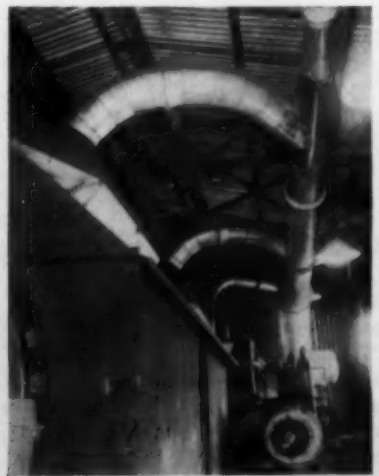


FIG. 3—CUTAWAY VIEW of dust collector shows the three main sections and individual elements including two mixers, eliminator and fan sections.



BREAKER is equipped with three ducts to insure complete collection of dust.

function without the other if the dual-unit system was adopted.

Stainless steel collecting ducts were used because the dust at Mine No. 31 is highly corrosive and the stainless steel would last considerably longer than carbon steel.

The dust collector and associated equipment are housed in a separate building. Although this was not a requirement, the company felt that the additional cost was justified to protect equipment from the elements, especially against freezing in cold weather.

The quantity of water consumed by the collector is controlled by the two valves shown in Fig. 2. The system uses approximately 18 gpm of water.

Sludge is collected in the sump and then pumped through acid-resistant pipe to the mine-refuse dump and impounded. No attempt is made to recover solids or the clarified water.

Dust-Collector Elements

The new wet-type dust collector consists of three main sections: (1) mixer section, (2) eliminator section and (3) suction-fan section.

Dust particles enter the mixer section (see Fig. 3) under suction from the fan. These particles pass through water-saturated air produced by spray nozzles and then strike and pass through a water-film-covered impingement element.

Impingement Element – This element is so constructed that no straight-line path exists for the air to pass through. As the dust-laden air turns, the dust, which has a greater inertia, impinges on the stainless steel wires of the element. Here the constant film of water from the sprays forces each dust particle to encase itself in water as it passes through the impinger. When the encased dust particles (water droplets) leave the impinger, their effective mass is greatly increased. These droplets then enter the eliminator section through turning vanes.

The sprays perform a dual role. In addition to wetting the impinger wires to catch the dust they also keep the wires flushed to prevent clogging. Although the impingement element is self-cleaning clogging will occur if sufficient water is not supplied continuously. The element is easily removed through a quick-opening door. The only step required to clean the element is to remove it from the mixer section, reverse it and put it back in place.

Eliminator Section—The eliminator is an axial cyclone containing stationary turning and straightening vanes. Air and entrained water-encased dust from the impinger pass through stationary turning vanes which impart a helical motion at an angle of approximately 45 deg. This motion creates a strong centrifugal force or cyclonic action that dynamically separates the entrained particles from the air and drives the dust-laden water to the walls of the cylinder. Here it is captured on the surface of "blind louvers."

These louvers are circular-opening water exits from the main chamber and are closed off from one another by a circular diaphragm. They are located around the circumference of the eliminator section and along its entire length. Each louver is a sealed trap that allows water to pass but not air. Dust and water drain from the louvers as a slurry into a removable sump under the eliminator. The sump has two discharge pipes through which the slurry drains into the slurry sump. The removable sump can be supplied with agitation to prevent slurry buildup, if this course of action becomes necessary for efficient removal of the accumulation.

The dustfree air in the eliminator passes through stationary straightening vanes. These vanes convert the rotating motion of the air to straight-line flow, recover the energy of rotation, reduce over-all draft loss and speed air exit into the fan section. The relative lack of pressure drop between the entrance and exit of the collector keeps horsepower requirements at a minimum in this method of dust collection.

Suction-Fan Section – A standard flow fan provides the moving force that pulls air through the dust collector. The fan is equipped with variable-pitch airfoil-cross-section blades that can be adjusted to compensate for changes in duct resistance or operating requirements after the installation of the dust collecting system.

Research creates new, dual-purpose splicing tape

Underwriters' Laboratories have listed a new self-fusing tape for use as "the sole insulation and covering of joints and splices in electrical conductors." It is the only tape of its kind with U.L. approval.

2 Tapes in 1

The new tape — Okoweld — was developed by Okonite. It is designed to be used as both insulation and sheath on rubber and plastic cables operating under 2000 volts.

Guaranteed against oozing or drying out

Being a self-fusing tape, it has no adhesive coating to dry out, ooze, or cause slippage of the tape wrappings. Okoweld fuses into a solid, layerless, non-porous wall that won't crack or deteriorate in weather. It resists acids, oils and most chemicals.

Applies quickly and easily

This new tape has excellent plasticity that allows it to conform well to irregular surfaces. In addition, it has optimum tensile strength for easy wrapping on a splice or termination.

Note:

For normal "wear and tear" no other protection need be applied over Okoweld.

However, if the cable is subjected to extreme physical abuse, a few wrappings of Manson friction tape provides a splice with maximum durability.

Ask for Okoweld the next time you order from your distributor.

Okoweld is manufactured by The Okonite Company, maker of superior electrical cables and the splicing tapes to go with them.

THE OKONITE COMPANY

Subsidiary of Kennecott Copper Corporation
Passaic, New Jersey

6468

These steels do cost more-

USS "T-1" Steel lightens world's largest drag bucket.

This 35½-yard dragline bucket – the world's largest – was recently built by the Electric Steel Foundry Company, Danville, Ill. It will be used in the Central Ohio Coal Company's open pit operation near Zanesville, Ohio. The big problem was to obtain the desired capacity, strength and ruggedness with the least possible weight. To do this, the builder used super-strength USS "T-1" Constructional Alloy Steel plate in the sides, bottom and back. No other steel would provide such high yield strength (100,000 psi), weldability, and resistance to impact abrasion.

The completed bucket scoops 106,000 pounds of load but weighs only 69,000 pounds. Of this, 8,500 pounds are USS "T-1" Steel and 12,000 pounds are USS MAN-TEN High-Strength Steel, which has a minimum yield point of 50,000 psi. The weight saved by these two steels goes into extra load capacity and results in lower costs per cubic yard moved.

but they do more — and save more!

Today's mining equipment is the biggest, toughest and brawniest ever built. Much of its ruggedness and long life come from high-strength steels, new grades of super-strong, super-tough alloy steels, and stainless steels. *Special steels make the difference.* Today's special steels for mining equipment are stronger—tougher—more resistant to abrasion and corrosion. Every pound of these steels in your equipment means money well spent. Money that pays dividends by cutting dead weight, increasing payload, extending service life, reducing downtime and saving operating dollars. *USS, Cor-Ten, Man-Ten, Tri-Ten and "T-1" are registered trademarks*

Here are the USS Steels that do more:

USS MAN-TEN Steel—High-strength with abrasion resistance and economy. (Minimum yield point 50,000 psi)

USS COR-TEN Steel—High-strength with superior atmospheric corrosion resistance. (Minimum yield point 50,000 psi)

USS TRI-TEN Steel—High-strength with toughness, weldability and abrasion resistance. (Minimum yield point 50,000 psi)

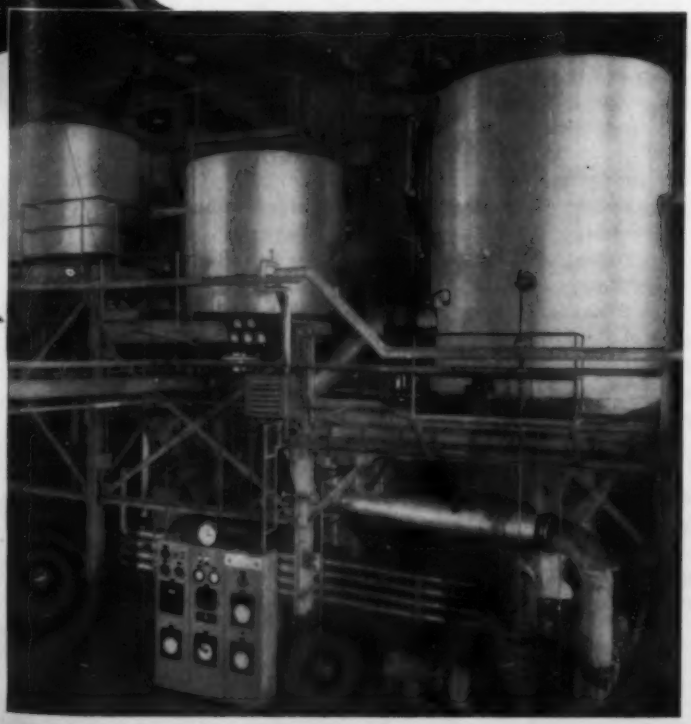
USS "T-1" Steel—Super-strength with impact abrasion resistance, weldability and toughness. (Minimum yield strength 100,000 psi)

USS STAINLESS Steel—High resistance to corrosion, elevated temperature and abrasion.

Each of these USS Steels is superior for certain applications. Our metallurgists will help you choose the best steel for your job. Contact our nearest sales office or United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS MAN-TEN Steel helps cut haulage costs.

This 50-ton Dart coal hauler operates at a rate of 5.9¢ per ton-mile. The old, smaller trucks cost 12.6¢ per ton-mile. These figures include truck operation, truck maintenance and other costs. Contributing substantially to the lower operating rate was the use of USS MAN-TEN High-Strength Steels which enabled the construction of larger trucks having 15% greater capacity than conventional units. In three years' time, no maintenance was required on the new trucks due to USS MAN-TEN Steel's high resistance to abrasion and impact.



Only Stainless Steel is good enough for this new extraction process.

Sheritt Gordon Mines, Ltd., Fort Saskatchewan, Canada, has a new method for extracting nickel, copper and cobalt from ore. The ore is dissolved in a bath of ammonium sulfate and ammonia and the metals are recovered from solution. Stainless Steel is the only metal that can be used in the pipes, tanks and pumps that give the "hot bath" of ammonium sulfate to the ore. Other materials can't take the corrosion and high temperatures in this work as well. Stainless has proved more economical than any other metal.

United States Steel Corporation—Pittsburgh
American Steel & Wire—Cleveland
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

USS

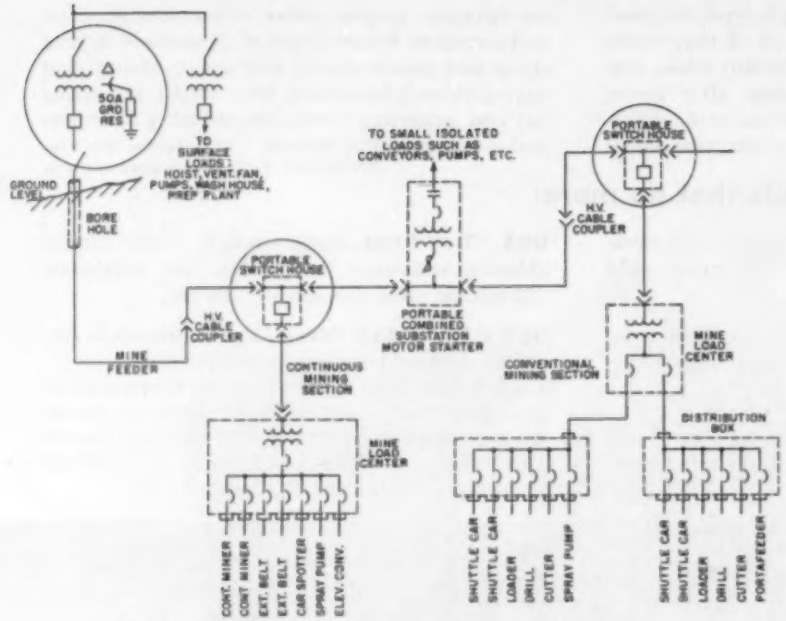


FIG. 1–TYPICAL SYSTEM for AC power in deep mining.

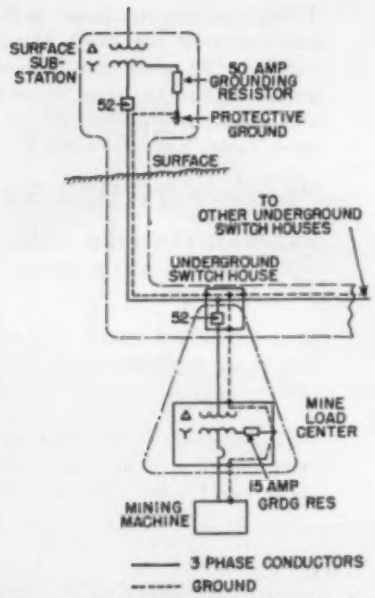


FIG. 2–PROTECTION provided by primary switching devices.

Designs for Efficient, Safe, AC Power Systems

Ground-continuity monitoring and effective voltage regulators are power-system improvements for AC mining.

By **D. E. Hamilton,** Electrical Engineer General Electric Co., Schenectady, N. Y.

THE USE OF AC POWER for trackless mining machinery is gaining wide acceptance throughout the entire mining industry. It is the purpose of this article to discuss primarily the problems associated with substations and underground switchhouses which feed and protect the primary mine distribution circuits. These circuits generally have a voltage rating of either 4.16 or 6.9 kv, although there are a few instances where the primary underground distribution of power is handled at levels as low as 2.4 kv and as high as 13.8 kv.

Fig. 1 is a one-line diagram of a typical power system for an AC mining operation. The equipment in the circles are the surface substation, where service voltage is stepped down to the primary distribution level of the mine, and the underground switchhouses which provide branch-circuit switching and relaying equipment for proper protection of the branch circuits and their connected apparatus.

We assume for purposes of our discussion that connected loads, such as mine load centers, do not have any primary protection—oil-fused cutouts or high-voltage circuit breakers—on the units themselves.

Fig. 2 shows the zones of protection afforded by equipment within the scope of this article. Note the similarity between the functions of these substations and underground switchhouses and the equipment used in open-pit operations where large, mobile electric-powered machines are employed. Indeed, many of these functions originated and have been proved in open-pit mining.

Surface Substation

The surface substation includes the equipment that transforms the service voltage to primary underground distribution voltage and protective devices for substation equipment and feeder circuits. It also includes system neutral grounding equipment and, where necessary, the equipment required to derive a system neutral. Fig. 3 shows a typical package substation for mining, including switchgear, transformer and ground protective equipment.

The service voltage level may be that which is delivered by the public utility or that used for sub-transmission service within the larger mining properties. It may therefore range from 4.16 kv up to 115 kv. The general range is from 6.9 kv to 44 kv. primary underground distribution voltage level is generally either 4.16 kv or 6.9 kv, with the latter receiving increased attention in the past year or so, especially since a 7.5-kv multipole cable coupler became available early this year.

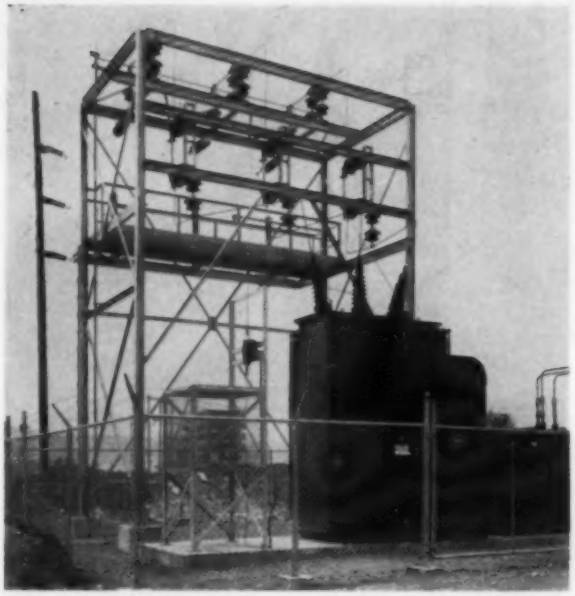
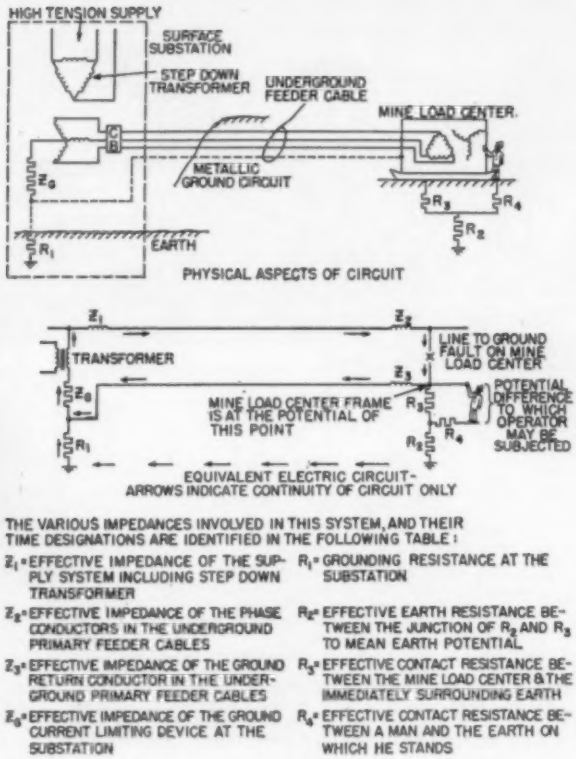


FIG. 3—PACKAGED substation for mine power systems.


HIGH TENSION SUPPLY
SURFACE SUBSTATION
STEP DOWN TRANSFORMER
UNDERGROUND FEEDER CABLE
MINE LOAD CENTER
C.B.
METALLIC GROUND CIRCUIT
EARTH
PHYSICAL ASPECTS OF CIRCUIT
TRANSFORMER
LINE TO GROUND FAULT ON MINE LOAD CENTER
MINE LOAD CENTER FRAME IS AT THE POTENTIAL OF THIS POINT
POTENTIAL DIFFERENCE TO WHICH OPERATOR MAY BE SUBJECTED
EQUIVALENT ELECTRIC CIRCUIT-
ARROWS INDICATE CONTINUITY OF CIRCUIT ONLY

THE VARIOUS IMPEDANCES INVOLVED IN THIS SYSTEM, AND THEIR TIME DESIGNATIONS ARE IDENTIFIED IN THE FOLLOWING TABLE:

- Z_1 = EFFECTIVE IMPEDANCE OF THE SUPPLY SYSTEM INCLUDING STEP DOWN TRANSFORMER
- Z_2 = EFFECTIVE IMPEDANCE OF THE PHASE CONDUCTORS IN THE UNDERGROUND PRIMARY FEEDER CABLES
- Z_3 = EFFECTIVE IMPEDANCE OF THE GROUND RETURN CONDUCTOR IN THE UNDERGROUND PRIMARY FEEDER CABLES
- Z_g = EFFECTIVE IMPEDANCE OF THE GROUND CURRENT LIMITING DEVICE AT THE SUBSTATION
- R_1 = GROUNDING RESISTANCE AT THE SUBSTATION
- R_2 = EFFECTIVE EARTH RESISTANCE BETWEEN THE JUNCTION OF R_2 AND R_3 TO MEAN EARTH POTENTIAL
- R_3 = EFFECTIVE CONTACT RESISTANCE BETWEEN THE MINE LOAD CENTER & THE IMMEDIATELY SURROUNDING EARTH
- R_4 = EFFECTIVE CONTACT RESISTANCE BETWEEN A MAN AND THE EARTH ON WHICH HE STANDS

FIG. 4—FACTORS involved in shock hazards.

The major item that distinguishes the surface substation feeding power to an AC-powered mine from an ordinary industrial type substation is the manner of grounding the neutral of the primary distribution system to provide maximum safety to mine workers. Mine load centers are not placed on permanent foundations and they are served with a power supply of relatively high potential, 2,400 v or more, brought to the equipment by means of a flexible power cable. Such installations present serious problems with respect to the safety of operators and maintenance personnel on the occurrence of ground faults. The term "ground fault" means contact between a line conductor or machine winding and a point at or near ground potential, as a result of an insulation breakdown or other cause.

A small amount of electric current —as little as ⅙ amp for 1 sec—can cause death. An even smaller amount can result in loss of muscular control. These low currents can flow through the human body at voltages as low as 100 V, if the skin is moist. Therefore, the answer to this problem has been to utilize a metallic ground conductor to connect the frames and enclosures of underground mining equipment, including underground power distribution equipment, solidly to the surface substation protective ground grid. The connection generally is made through the ground wires built into the power cables.

With the effectiveness of grounding the underground equipment frames and enclosures dependent upon the adequacy of the earth ground at the surface substation and the continuity of the ground conductors in the cables carrying power to the face, it is important to review the factors which may cause a potential difference to appear between the earth ground and the underground equipment frames and enclosures.

Factors Which Determine Severity of Hazard

The relative importance of the factors which affect the shock-hazard problem can be seen in Fig. 4, in which the physical layout of the system is at the top and the equivalent electrical diagram is below. The two most important factors are (1) the magnitude of ground-fault current and (2) the resistance from machine frame to ground (R_3).

The ground-fault current is determined by the power-supply voltage acting on the fault-circuit impedance. The normal power-system impedance, composed of substation transformer and transmission cable impedances, is of necessity relatively low for proper performance of power equipment. The fault current might be thousands of amperes if it were limited only by these impedances. A protective system designed to handle such large ground currents would require an extensive and costly low-resistance grounding circuit for the portable machine. However, a lower value of ground current can be secured, with no sacrifice in machine performance, by introducing a neutral grounding impedance, Z_g. If the ground current is made too low, in comparison to normal line current, troublesome relay problems will result.

The mine load center frame-to-ground resistance (direct contact of supports with earth) is very indefinite. Even under favorable circumstances, the ground resistance will not be low, and it may be 100 ohms or more in mine entries. Even a group of driven ground rods at the mine load center may have a ground resistance of 10 ohms or more unless the installation is carefully made and maintained. Note that a 10-ohm ground and a ground-fault current of 100 amp would produce a shock-hazard poten-

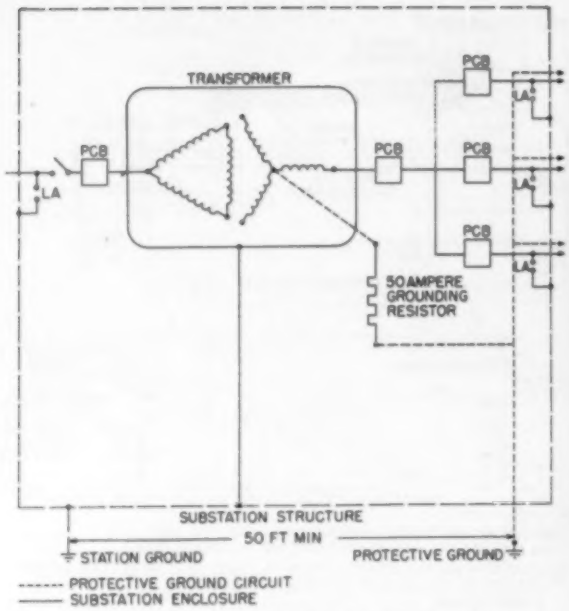


FIG. 5—**SURFACE** substation grounding system.

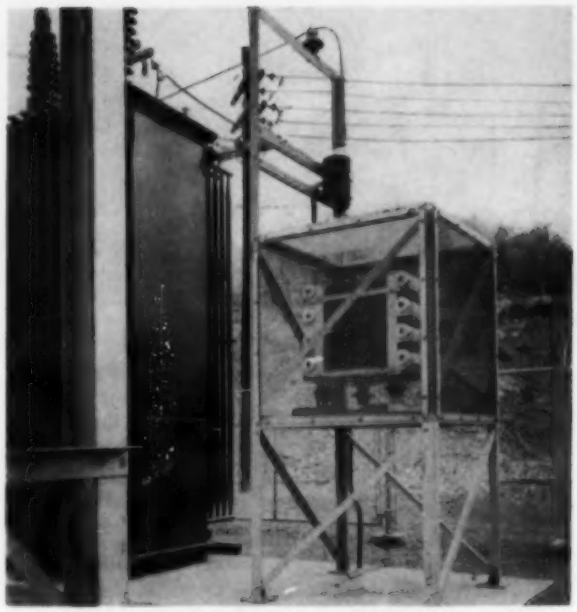


FIG. 6—**NEUTRAL** grounding resistor and supports.

tial of 1,000 V between the machine and ground.

The ground-fault current level can be limited to as low as 25 amp in most cases without causing serious relay problems. The ground-circuit resistance should be such that the IR drop due to the ground-fault current does not exceed 100 V. For example, for a 25-amp fault level, the resistance should not exceed 4 ohms, for reliable ground-circuit resistance of such desired values requires a ground-return conductor from the frame of the portable machine back to the supply substation, as represented by impedance Z_3 in Fig 4. This ground-return circuit alone is designed to come within the required limit since other ground paths are so variable. This practice assures adequate safety even if the ground resistance of these other ground paths is very high.

In determining the maximum level of ground current during fault conditions, the following important point should be considered: The objective is not to limit ground current, as such, in consideration of shock hazard, but rather to limit the potential rise above ground that appears on the frames and enclosures of the equipment connected to the power system. Any combination of ground current and ground-return resistance which gives a resultant maximum potential rise meets the intent of the grounding system.

Thus, a system having ground-fault current of 200 amp through a ground-return resistance of 0.5 ohm is just as safe from the standpoint of shock hazards as a system having a ground current of 50 amp through a ground-return-resistance of 2 ohms. Since a maximum of 2 ohms in the ground return path is easily obtained by the use of modern mine power cables with ground wires in the interstices, the use of 50-amp neutral grounding resistors has been accepted by many operators of AC-powered mines.

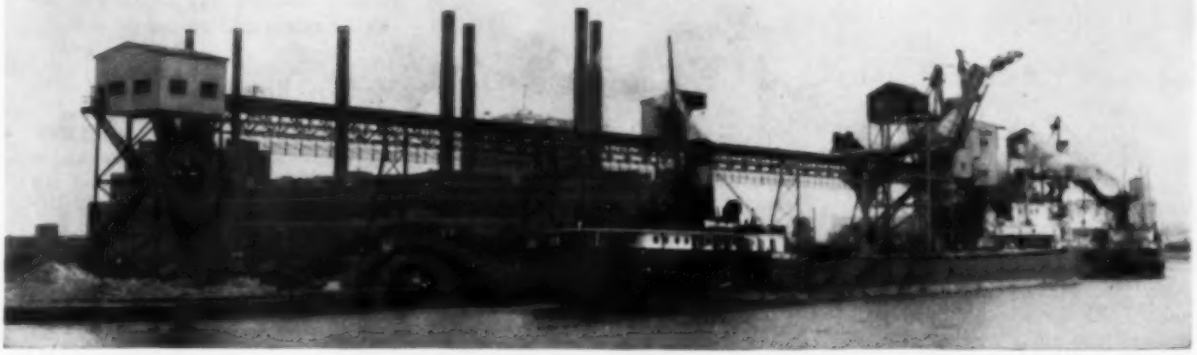
To eliminate the possibility of a burn-out of the ground current-limiting resistor, which would impose dangerous conditions on the system, the resistor must have a current-carrying capacity and heat-dissipation ability sufficient to handle the maximum ground-fault current continuously. This is an important factor to be considered in the selection of a resistor.

Surface Substation Grounding

An important element in the design of the main substation is illustrated in Fig. 5. The ground-fault current, which may be supplied by the high-voltage supply system, is not controlled by the local electric system design, and it may often be quite large. Any line-to-ground flashover at the main substation will allow the high-voltage system ground current to flow into the main substation station ground. This current would persist for a time interval governed by the switching time of the high-voltage protective circuit breaker. A 5,000-amp ground fault current—which might easily be equalled or exceeded in actual operations—in combination with the main substation ground resistance of 2 ohms—which would be considered a good station ground—would cause the entire main substation structure to be elevated 10,000 V with respect to ground, and remain at this potential until the high-voltage protective circuit breaker operated, probably from ¼ sec to 1 sec. If the underground protective ground circuit were physically interconnected with the main substation ground, it is obvious that this high potential would be distributed to the frames of all portable machines and thus constitute a serious hazard. A similar hazard would occur when the primary or secondary lightning arresters discharge a voltage surge.

As a result of these considerations, it is essential that the protective ground circuit, originating at the low-voltage neutral of the step-down transformer, be insulated from the main substation ground system with the same insulation level as applied to the low-tension line circuit, and grounded at an adjacent separate grounding connection. The voltage

Coal moves fast from railroad cars to ships at this transfer dock.



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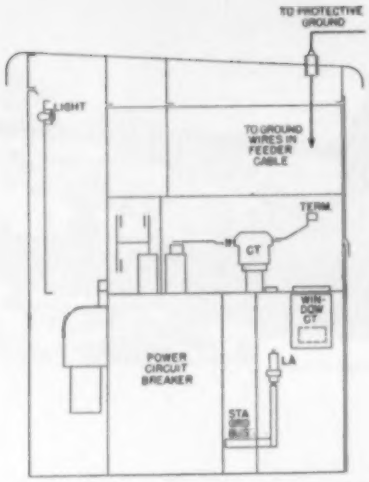

FIG. 7—SWITCHGEAR arrangement for mine circuits.

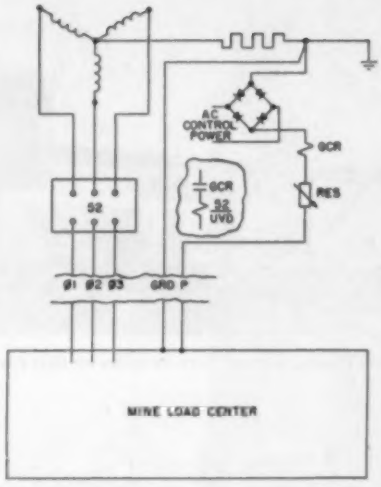

FIG. 8—GROUND continuity check relay scheme.

gradient in the earth surrounding the main substation diminishes very rapidly as one moves away from the substation. In general, a 50-ft separation between the two grounding terminals is sufficient to prevent any substantial coupling between the two ground beds. It is important to avoid any direct interconnection between these two grounding points such as would be produced by buried metal pipelines.

Fig. 6 illustrates the installation of a neutral grounding resistor at a mine surface substation. The resistor is mounted on insulators to isolate the resistor from the mounting framework which is naturally tied to the station ground. Also, the connection from the top of the resistor to the neutral of the transformer is supported on an insulator. This insulation should be fully rated for the system voltage. It is also important that the transformer neutral bushing be fully rated for the system voltage since the transformer tank itself should be connected to the station ground.

If a packaged unit substation is used at the surface substation it is necessary to provide a means of terminating the ground conductors of the mine feeder circuits to the substation protective ground point. Fig. 7 illustrates a solution to this problem. A fully-rated roof-entrance bushing is used to provide a means of tieing the ground wires in the interstices of the mine feeder cable to the protective ground while still maintaining isolation of the station ground from the protective ground. In those cases where a line-up of metal-clad switchgear was used to protect several feeder circuits two ground buses would be provided, one a conventional non-insulated station bus and the other a fully insulated protective ground bus.

Circuit Breaker Tripping

One of the factors governing the safety of personnel in AC-powered mines is that of maintaining continuity of the ground-fault current path between the underground equipment and the surface substation protective ground. Circuits have been developed which continuously monitor the continuity of the ground circuit. Fig. 8 illustrates a "ground continuity check" relay circuit. The design of this circuit has three basic requirements, as follows:

1. It must fail safe;
2. It must trip the breakers without need for control power;
3. It must be unaffected by changes in the length of the feeder cable.

The first requirement is met by making it necessary for the GCR relay to be picked up before the circuit breaker can be latched in the closed position. The second requirement is met by having the N. O. relay contact in series with the circuit breaker undervoltage device. The third condition is met by insertion of a resistor in series with the circuit. This resistor should be of sufficient ohmic value that the pilot ground wire resistance amounts to only 1 or 2% of the total circuit resistance. The use of DC also eliminates a need to consider the pilot wire and ground wire reactance in the circuit.

Appropriate current transformers and an inverse-time ground protective relay should be installed on each outgoing feeder in addition to normal line over-current protection. A back-up inverse-time overcurrent relay, actuated by a current transformer installed in the neutral circuit, should be included. It should be arranged to automatically disconnect all power service to the entire portable machine system. It may be desirable to include optional features such as phase current balance and automatic reclosing relays and so on.

Voltage Regulators

Voltage regulation is a major consideration in designing a power system for AC mining. The need for good voltage regulation has generally resulted in the use of oversize cables selected primarily on the basis of allowable voltage drop in the system. Since the cable cost represents from 50 to 60% of the initial investment for the mine power system, it is important to look for alternate ways to insure adequate voltage at the face. An economic study was recently made of a proposed AC power system for a new mine, with the object of comparing the cable cost of providing for voltage regulation in oversize cables or, as an alternative, through the use of a 10% buck-or-boost induction voltage regulator. The cable cost was $20,000 greater in the system employing cables selected primarily on the basis of voltage drop. These savings were based on the early operation of the mine when only one-third of the ultimate footage of high-voltage cable would be required. For the maximum distances expected after full development of the mine, the total savings in first costs for high-voltage cable was approximately $80,000.

The voltage regulator should be installed in the surface substation. This will eliminate additional costs for a special low-height unit or construction of a vault for an underground unit. The surface-substation location is ideal for the added reason that it can be applied to compensate for voltage drop in the system ahead of the substation and, through line-drop compensation, will adjust for

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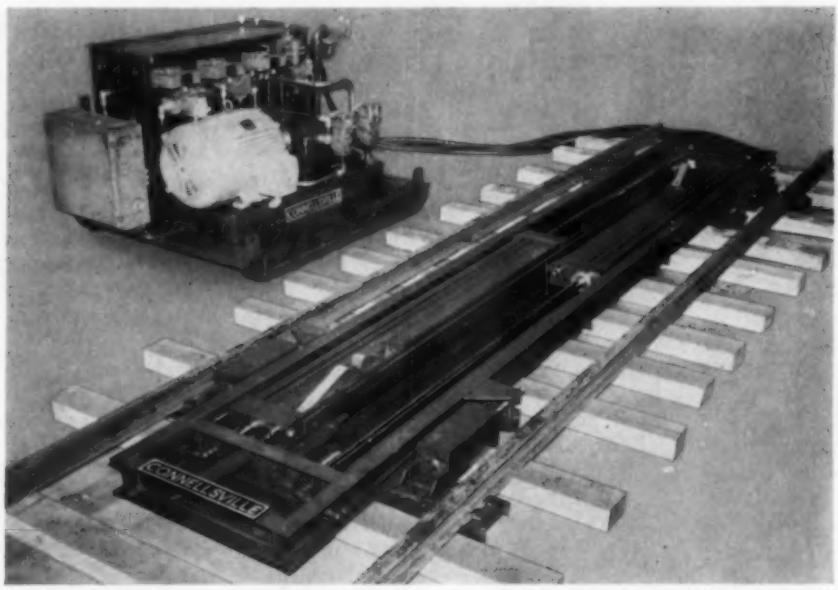

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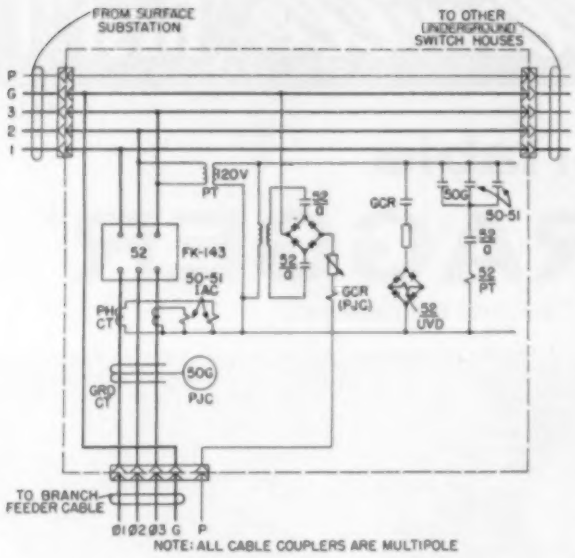

FIG. 9—**ELEMENTARY** diagram of switchhouse.

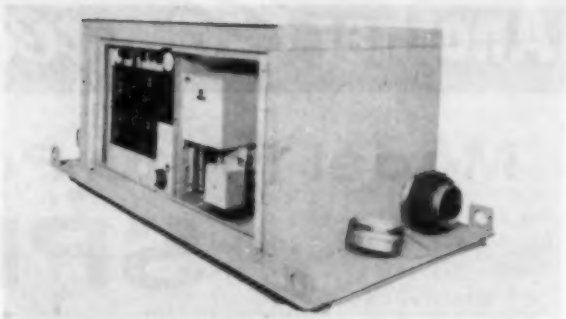

FIG. 10—**SWITCHHOUSE** for use on 7.2-kv, 150-mva system.

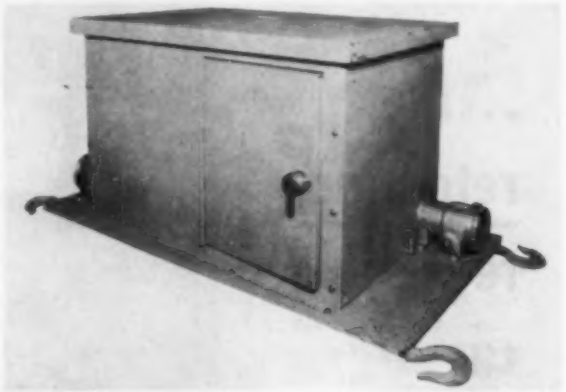

FIG. 11—**SWITCHHOUSE** for use on 4.16-kv, 50-mva system.

the voltage drop in the mine feeder circuits.

Underground Switchhouses

The underground switchhouse is a portable high-voltage switching station used to protect branch feeder circuits in the mine. Fig. 1 shows the use of an underground switchhouse at each point where a panel feeder circuit is connected to the main feeder circuit cable. The use of this equipment is most important since a ground fault on a branch feeder circuit will not cause tripping of a circuit breaker back at the surface substation, thus shutting down a section or the entire mine. Secondly, it permits the intentional deenergizing of a branch feeder circuit without the necessity of deenergizing the main feeder cable. This feature is an important consideration, since it is frequently desired to add lengths of cable to the branch feeder circuit to keep the Load Center close to the mining machinery.

An elementary diagram of a typical switchhouse is shown in Fig. 9. The main feeder circuit is looped through the switchhouse. Cable connections are made with cable couplers. The branch feeder circuit is internally connected to the main feeder circuit through an oil circuit breaker having an interrupting capacity adequate for the system.

The basic protective relaying system consists of:

1. Phase overcurrent tripping, using current transformers with time and/or instantaneous overcurrent relays and the circuit breaker shunt trip coil.

2. Ground overcurrent tripping, using a window-type current transformer, an instantaneous overcurrent relay and the circuit breaker shunt trip coil.

3. Ground continuity relaying is accomplished in the same manner as described earlier for the surface substation circuit breakers.

Note that the ground continuity relaying function also inherently provides undervoltage tripping of the circuit breaker. Therefore, it is not necessary to use a stored energy scheme, such as a capacitor trip device, to insure tripping when a double line-to-ground fault collapses the system voltage.

Fig. 10 shows an underground switchhouse with the front doors and top cover removed. This particular unit is designed for operation at 6.9 kv and is equipped with a 150-mva electrically-operated oil circuit breaker. To meet the user's special requirements, this equipment was supplied with several additional relays and recorders which are not generally required for this type of equipment. The cable coupler shown on the switchhouse is a recently-developed item rated at 7.5 kv, 300 amp, and furnished with the necessary pilot contacts for a ground continuity check circuit. The contacts within the coupler are of varying depth to insure that the ground circuit is completed first, the phase circuits second and the pilot circuit last.

Overall dimensions of this switchhouse are 42 in high, 48 in wide and 98 in long. This same enclosure is suitable for mounting two 7.2-kv, 50-mva manually-operated circuit breakers. A similar unit designed for one such circuit breaker is shown in Fig. 11. This switchhouse is used in a 4.16-kv system. Therefore, the cable coupler shown is rated at 5 kv, 200 amp. Overall dimensions are 42 in high, 42 in wide and 78 in long.

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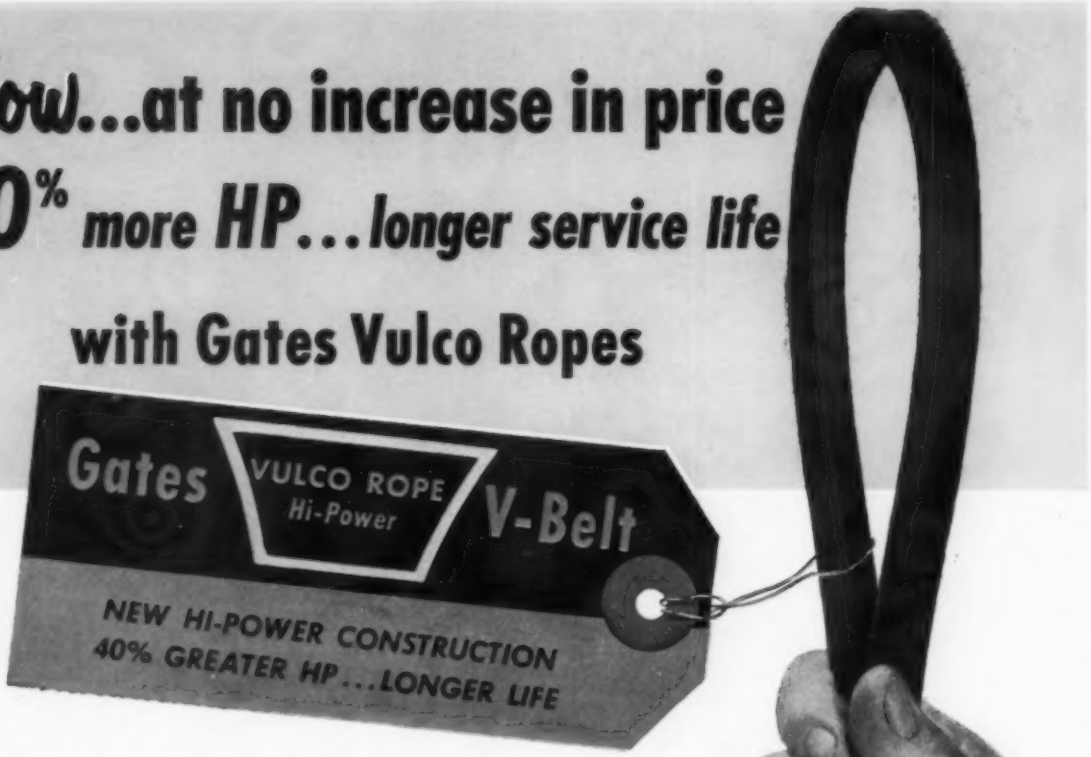

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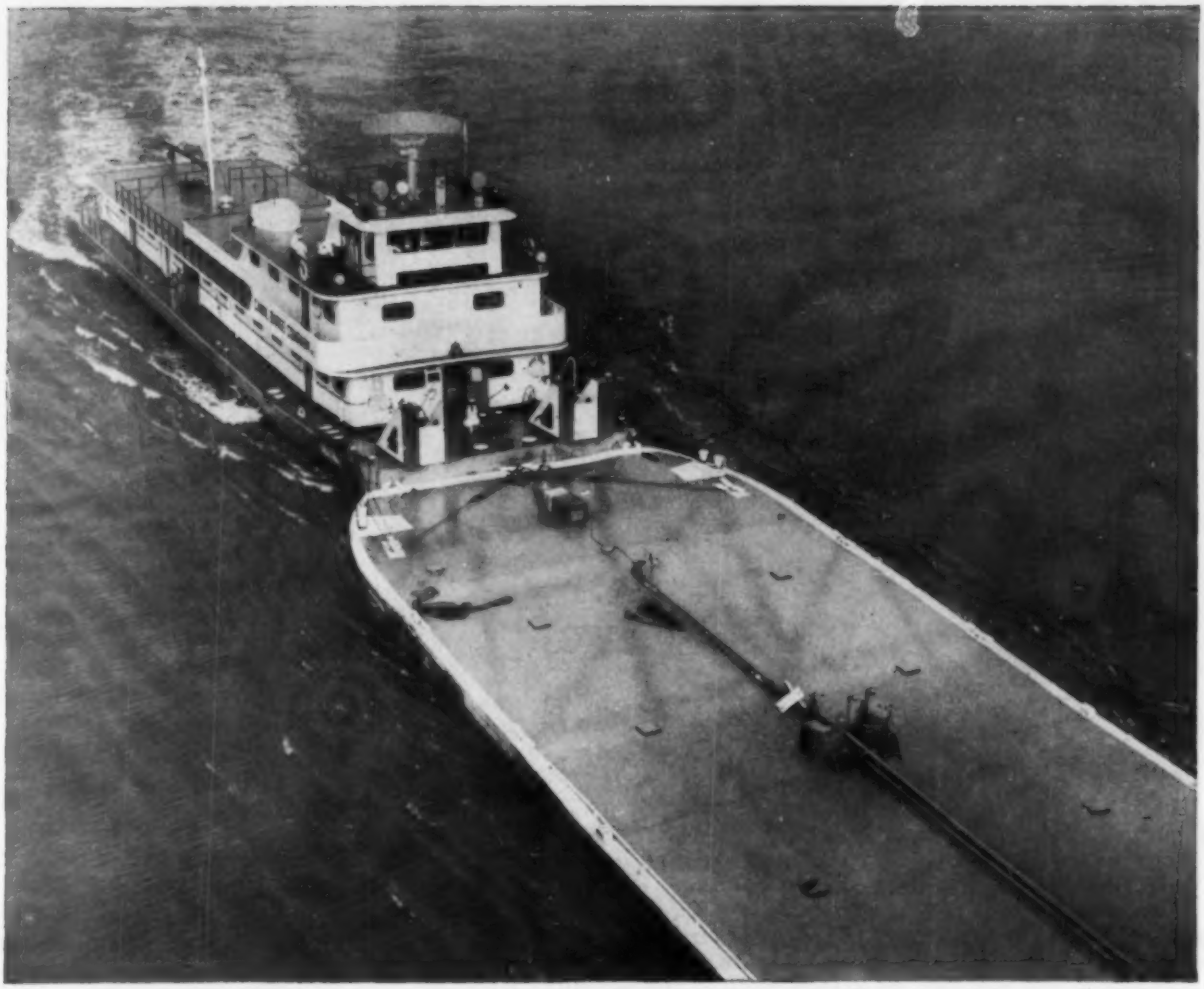

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This means that the *Sally Polk* — despite the 4.1-mph current—moved its cargo about 2,375,000 ton-miles in this one-day voyage.

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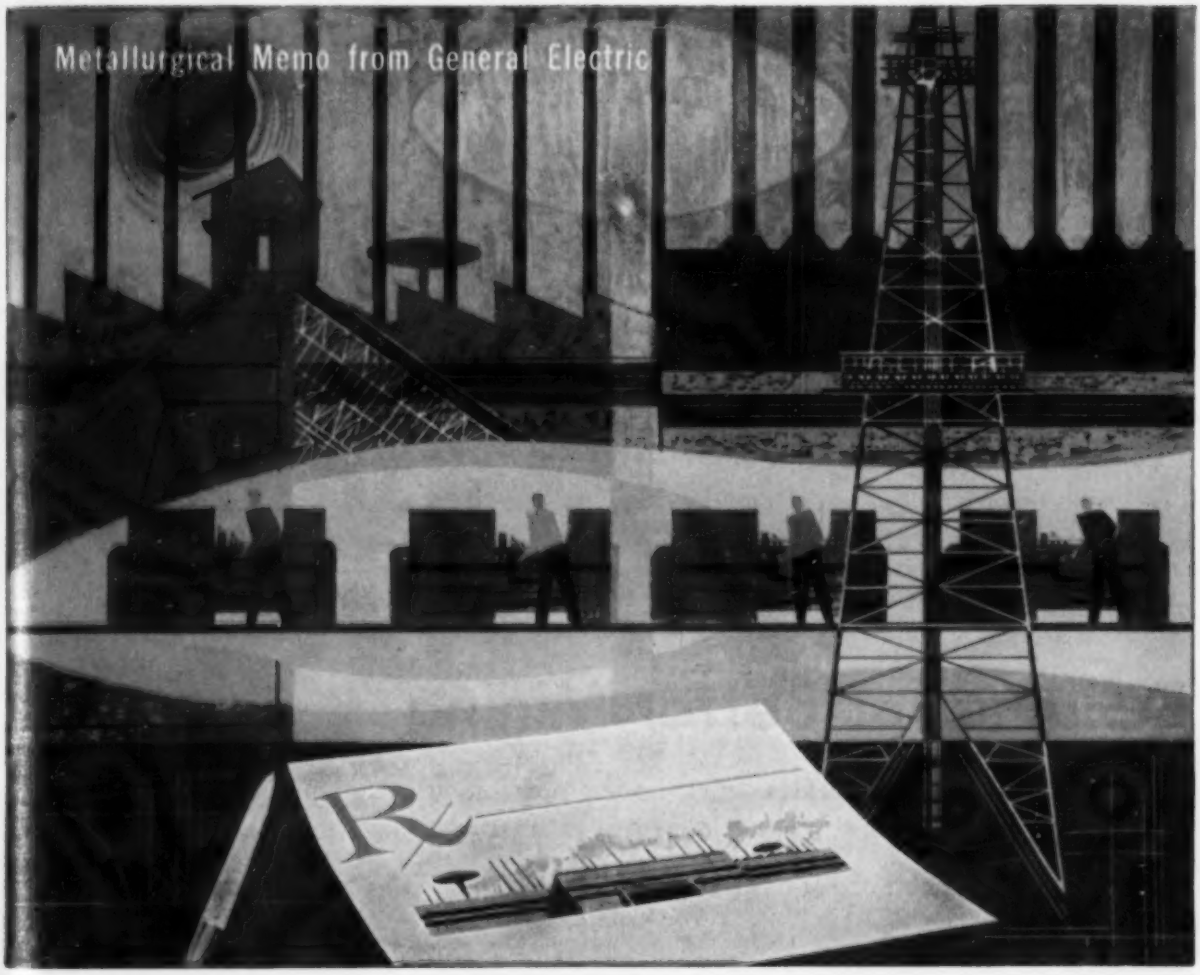

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Metallurgical Products Department reports on Carboloy® cemented carbides . . . and on two better mining bits that contribute importantly to lower cost coal mining

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LIGHTWEIGHT 10-YD BUCKET replaces former 8½-yd on one of Sullivan Trail's two new draglines. This bucket, in use at Franklin stripping at Wilkes-Barre, is made entirely of steel plate except for lip and teeth.

Building for Better Mining

Fabricating dragline buckets, truck bodies, preparation equipment, drill rods or rebuilding carbide bits . . . all in a day's work for the shop force at Sullivan Trail Coal Co.

STEADY EXPANSION in stripping, deep mining and preparation activities over the years has been accompanied by a parallel increase in size and work capacity in the shops of the Sullivan Trail Coal Co., at West Pittston, Pa. Shop facilities, such as machine tools and added working bays, have been acquired to permit shop services to keep pace with the increasing size and complexity of equipment, especially the strip mining machines.

Sullivan Trail's management, headed by President Louis Pagnotti, now has decided to convert the shops into a separate entity, the Sullivan Trail Mfg. Co. This step was taken as a result of the experience gained through years of experimentation with dragline buckets of the company's own design, with bit rebuilding procedures for the company's overburden drills and with the fabrication of coal preparation equipment.

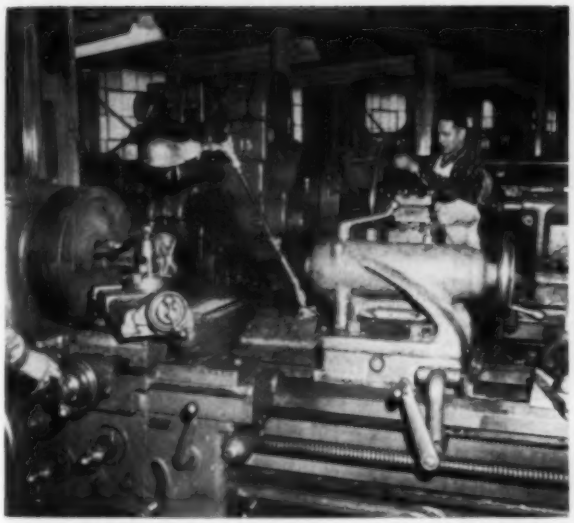
Building Dragline Buckets

The first market offering of the new company is a line of dragline buckets in capacities from 2½ to 12 cu yd. Special steels are employed, instead of the mild carbon steel in many buckets, to provide longer life and reduced bucket weight.

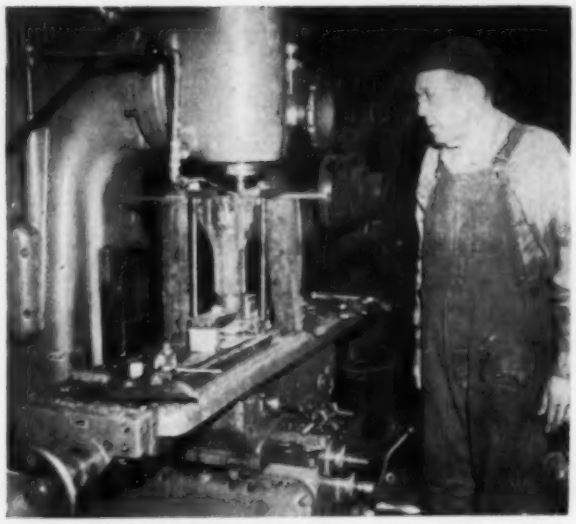
Jalloy and Jalten, both alloy steels produced by Jones & Laughlin Steel Corp., are used to make all parts of the bucket except lip and teeth. The latter are made of cast manganese steel.

Jalloy is used in bucket areas subject to great strains, impact and abrasion. These parts include the arch, jaws, back, bottom, wear plates at the bottom and bottom corners of the bucket. The arch is made by cold-forming Jalloy plates into a 96-in radius in the 10-yd bucket. Sides of the bucket are made from 6x20-ft plates of Jalten, which permits savings

FIRST STEP is building up body of bit by deposition of suitable welding rod to restore original dimensions.



AFTER BUILDUP the bit is turned to proper gage on one of Sullivan Trail's lathes.



SLOTS FOR CARBIDE INSERTS are made to close tolerances in face of bit by operator of milling machine.

in weight up to 4,000 lb in the fully-rigged larger sizes. As a result the Marion 181-M dragline (see *Coal Age*, May, 1958, p. 114) owned by the company now swings a 10-yd bucket in place of the original 8½-yd unit. Tests over the past 5 yr indicate an increased life of up to 30% before rebuilding is required.

Steel stiffeners along the sides of the bucket, as shown in the illustrations also serve to protect the hoist trunnion from damage while the bucket is loading. The hitch plate and hitch extension at the front of the bucket are designed to facilitate removal and replacement of the extension. The 3-in hitch pin is held in place by a through-bolt in the upper part of the hitch plate. Parts of the bucket subject to extremely hard wear are built up by hardsurfacing to stretch out the useful life of these parts.

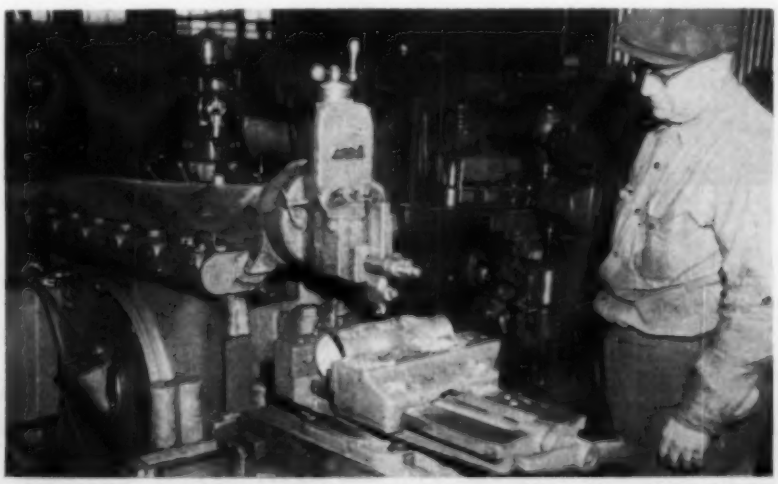
Reconditioning Bits

Sullivan Trail operates eight Ingersoll-Rand Drillmaster overburden drills at anthracite and bituminous stripping operations. Much of the drilling is done with down-the-hole units equipped with 6½-in carbide-inserted rockbits. Keeping these bits in shape for maximum drilling efficiency is another of the important missions of the shop at West Pittston.

In many instances the worn bits have been reduced in service to a gage of 5½ in. These must be built up and machined to their original conformation and new inserts must be provided. Sullivan Trail is able to do its own reconditioning because the required machine tools are available in the shop, and the work on the bits provides more opportunity to keep the tools busy and productive.

The worn inserts are burned out of the slots before the body of the kit is built up. Jetweld 90 rods are used

STAGES IN REPAIR—Worn out (left); built up and slotted; completely rebuilt.



ONE STEP in manufacture of drill rods is cutting 3-in wrench on drill-rod end. Most of Sullivan Trail's drilling tools are made in shop.

30-TON COAL BODY, which is interchangeable with rock body on haulage truck, is made from steel plate patterned and shaped in the shop.

SUBSTRUCTURE of coal is laid in foreground as body in background nears completion. Assembly-line fabrication is planned.

BUCKET-REPAIR BAY illustrates Sullivan Trail's shop growth to keep pace with expansion of mining operations in anthracite and bituminous.

to deposit the added material. The bit is then turned to size and shape on a lathe and slots for new inserts are cut on a milling machine. Air ports are reamed to their original diameter. The final step in rebuilding is silver-soldering the new inserts, supplied by Kennametal, in the slots. The utmost care is taken in the turning and milling operations to reproduce the original clearance angles of the overburden bit.

Prior to the machining operations the body of the bit is heat-treated to eliminate hard spots which might damage the milling tool.

The company now is preparing to make this bit-rebuilding service available to others using large overburden drills. Drill steels for overburden drilling also are made up in the shop.

Making Truck Bodies

Now in the works at Sullivan Trail is a new truck body designed to carry 30-ton loads of coal. The new body will be interchangable with 22-yd rock bodies now used on the company's fleet of Euclids.

On a number of anthracite jobs spoil must be hauled out of the pits. Then as coal is exposed it must be hauled out of the pit to permit removal of the next lower cut of overburden. The new body can be substituted for the rock body in a minimum of time to speed the removal of coal from the pit. The body under construction in the accompanying photos is the first to be built at Sullivan Trail. The plan is to set up an assembly-line type of operation for construction of the bodies after the techniques have been worked out and refined on this pioneer unit.

The bodies are made of alloy steel which arrives at the shop in plates. All layout work, cutting and bending is done by Sullivan Trail's own shop equipment.

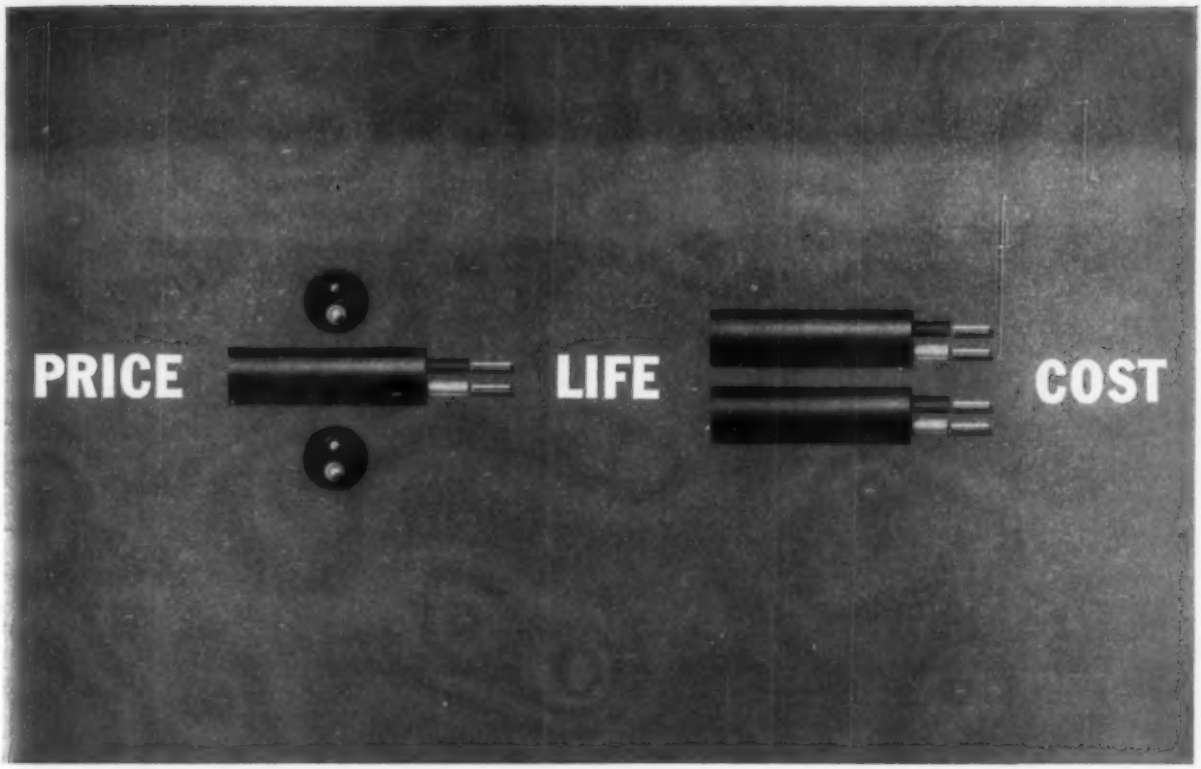
Preparation Equipment

The latest undertaking of Sullivan Trail Coal Co. is the operation of Loomis preparation plant at Wilkes-Barre, Pa., which is now being remodeled and re-equipped with coal-cleaning and materials-processing equipment made at the West Pittston shop. For a number of years the shop has been turning out the equipment employed in the company's own plants —everything from mine-run conveyors to pockets for prepared coal.

Also available is rebuilding service on diesel engines, an endeavor which is based upon experience with the coal company's own vehicles and earth-moving machines.

One of the main reasons for Sullivan Trail's expansion into the manufacturing and service fields is a desire on the part of management to insure steady employment for the 140 employees of the shop. This is of particular value in this area which has been hard hit by declining employment in the anthracite region.

Other officials of the company, in addition to Mr. Pagnotti, are James J. Tedesco, secretary-treasurer; Henry Ventre, vice president; and Joseph Pagnotti, mechanical and electrical engineer. Armand (Rex) Fronduti is general superintendent of the shop.



Tirex ...A Case of Symbol Arithmetic

True economy cannot be measured by initial price alone. In buying cords and cables, for instance, the products with lowest prices could well be very expensive in the long run.

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On this basis, your logical choice is SIMPLEX TIREX. Tirex neoprene-armored cords and cables are made by the original Simplex "cured-in-lead" process. Tough, flexible, and long-lived, Tirex gives you genuine economy by giving you complete dependability.

Write for your copy of the Simplex Tirex cord or cable catalog, which contains complete information, including specifications and application data.

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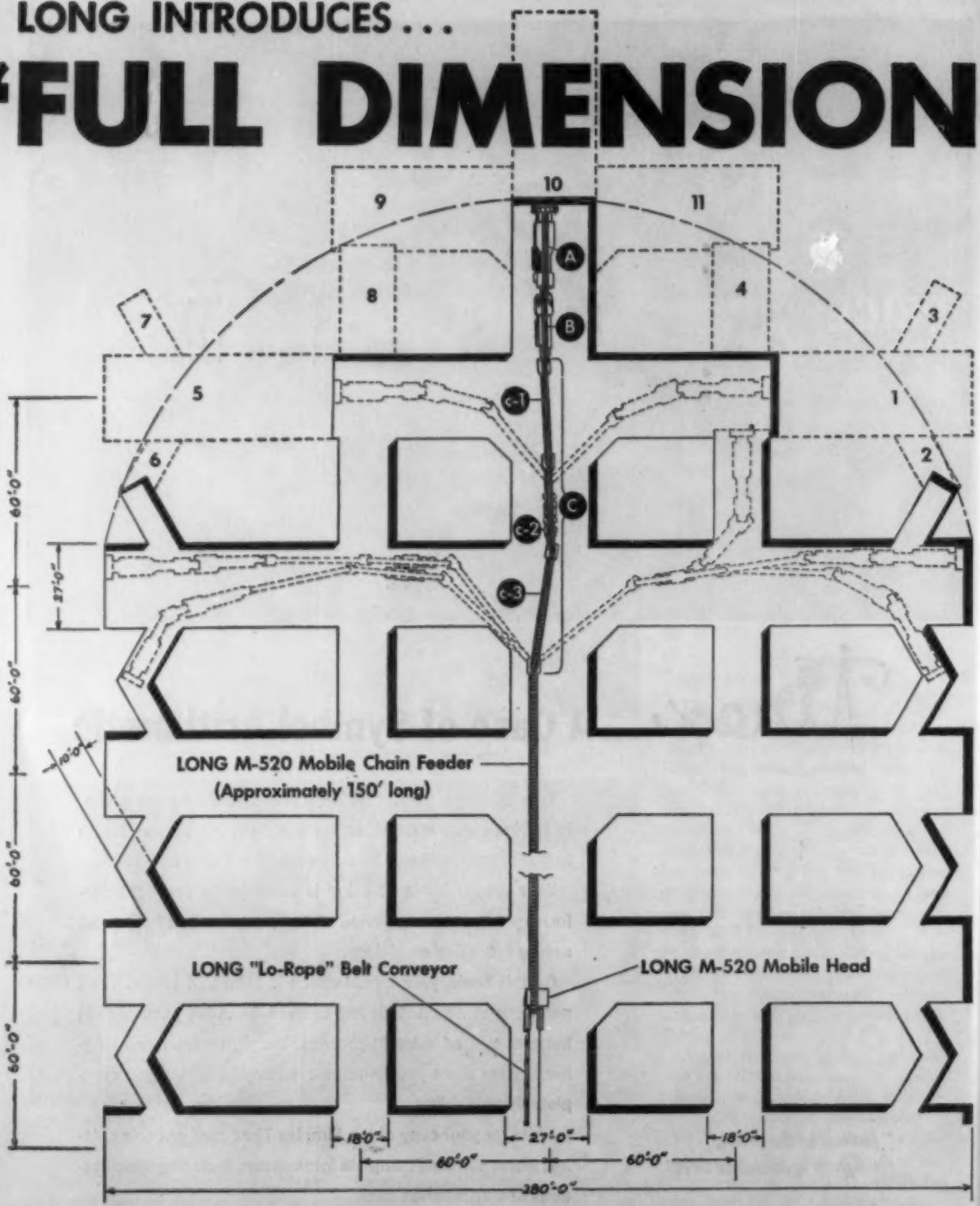
LONG INTRODUCES . . .

"FULL DIMENSION"



Coal is mined by a continuous mining machine followed by a LONG 188 Loader. Behind the loader is the three-unit mobile bridge, which feeds on a mobile chain feeder approximately 100-150 feet long. Coal is moved from the mobile chain feeder to a LONG "LO-ROPE" Belt Conveyor, which may be driven by a mobile crawler mounted head section and which is equipped with a "HY-WINDER" belt winding station.

Extensibility of the "FULL DIMENSION" Conveyor System during operation is provided by the movement of the second Piggyback on the mobile chain feeder a distance of up to 150 feet, plus the movement of the first Piggyback on the mobile bridge carrier a distance up to 20 feet. Extensions or retractions of the belt conveyor are made at breakthrough intervals, usually 50 or 60 feet.

Equipment Designation (See Diagram)	Effective Length
A. Continuous Mining Machine	30'0"
B. LONG 188-D Loader	22'0"
C. 3-Unit Mobile Bridge Includes:	
c-1 LONG PT-218 Piggyback Conveyor	32'2"
c-2 LONG Mobile Bridge Carrier	25'8"
c-3 LONG PT-218 Piggyback Conveyor	38'8"
Coal Trajectory From Miner (Not shown)	2'0"
Total Effective Length	**150' 6"**

MINING —THE FIRST AND ONLY

EXTENSIBLE CONVEYOR SYSTEM THAT OFFERS:

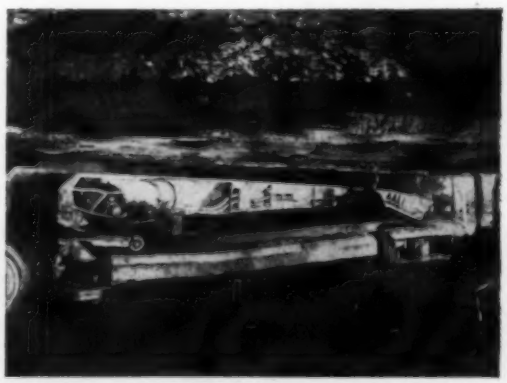
- **Multiple headings from one conveyor**
- **Recovery of pillars up to 100 feet wide**

The LONG "Full Dimension" Extensible Conveyor System offers higher capacity conveyor mining with all the flexibility of shuttle car haulage. Because of its long articulated reach and extensibility, this new system can be applied to almost any normal mining plan. The example on the opposite page is but one of many which can be used practicably.

Advantages of "FULL DIMENSION" MINING which have been demonstrated in many months of development and experimental use include:

- Continuous three-shift operation with virtually no delays for transportation.
- 67% increase in production per face man over a six-month period.
- Belt extensions are made, using the exclusive "HY-WINDER", at 60-foot intervals in approximately 15 minutes.
- Each extension (in 48" coal) permits the mining of 1500 tons with no delays except for repositioning the continuous mining machine.
- Deeper rooms and/or fewer belt moves with practical room transportation distance of 1000 feet or more.
- Dramatically improved housekeeping on the section with no constant movement of mobile machinery.
- Improved ventilation and safety because permanent stoppings are carried closer to the face with only the last open breakthrough being used for production haulage.
- Maximum crew cooperation resulting from the elimination of lifting, dragging, dodging, etc.
- Greater efficiency as there is more concentration of activity in a single working face for longer periods of time.
- Important safety advantages in improved roof support result from not having to keep open multiple haulways beyond the last open breakthrough.
- No wait whatsoever for transportation (except the 15 minutes required at each 1500 ton interval).

The "HY-WINDER" provides mechanical assistance in extending or retracting the belt conveyor. An extension requiring 15 minutes provides reach sufficient to mine over 1500 tons. (See diagram at left.)



The three-unit mobile bridge, an exclusive LONG development, is highly mobile and maneuverable. It provides articulated reach up to 150 feet during full continuous conveyor operation.

Write for details or a demonstration

The **LONG** Company
Oak Hill, W Va

Thermal Drying of Coal

A statistical study of types of driers at bituminous plants in the U. S., and tonnages and sizes handled.

By **W. H. Young**, Chief, Bituminous-Coal and Lignite Section and **R. L. Anderson**, Supervisory Commodity-Industry Analyst, U. S. Bureau of Mines, Washington, D. C.

SINCE most of the bituminous coal produced in the United States is sprayed with water underground to reduce the dust in mining, cleaned by wet methods, or subjected to wet screening in the tipple, the problem of removing surface moisture from the coal is ever increasing. It is necessary to remove the moisture from bituminous coal for any one or a combination of the following reasons:

1. To avoid freezing difficulties and facilitate the handling of the coal during shipment and in transfer to the fire box;
2. To reduce the heat wasted in evaporation of surface moisture on the coal, thus increasing efficiency in burning;
3. To decrease transportation costs;
4. To improve the coal so that it may be used for specific purposes, as in the production of coke and briquets;
5. To precondition raw coal so that it may be cleaned by dry-cleaning methods.

Removal of surface water from fine bituminous coal usually presents an individual problem at each preparation plant. Fine coal has a greater surface area per unit weight than does coarse coal. Therefore, its capacity for retaining moisture is proportionately greater. It is relatively easy to remove water from coarse coal, but it may be a major problem to remove moisture from minus 10-mesh

TABLE I—U. S. Thermal Drying of Bituminous Coal at Mines By Type of Drying Equipment, 1957

Type of drier	Number of thermal units	Net tons thermally dried	Percentage of total
Rotary	5	272,000	0.8
Screen	62	7,492,000	23.5
Vertical tray and cascade	50	5,643,000	17.7
Continuous carrier	5	1,431,000	4.5
Suspension or flash, including—fluidized-bed	34	8,530,000	26.7
Multilouvre	45	8,574,000	26.8
Total	201	31,942,000	100.0

TABLE II—Relation Between Size of Feed and Type of Thermal Drier at Bituminous Mines, 1957

Type of drier	Top size reported		Size most commonly reported
	Minimum	Maximum	
Suspension or flash and fluidized-bed	1/8"	3/8"	1/4" x 0
Multilouvre	1/8"	1 1/4"	1/4" x 0
Rotary	3/16"	3/8"	(1)
Vertical tray and cascade	1/4"	1 1/2"	1 1/4" x 0
Screen	3/8"	2"	1 1/4" x 1/4"
Continuous carrier	3/4"	1"	(1)

[1] Only two sizes reported.

TABLE III—Comparison of Thermal Drying of Bituminous Coal With Mechanical Cleaning at U. S. Mines by States, in 1957

State	Total number of cleaning plants	Number of plants with thermal drying	Production mechanically cleaned, net tons	Net tons thermally dried	Percentage of cleaned coal thermally dried
Illinois	60	16	42,455,000	3,298,000	7.8
Indiana	21	9	11,588,000	2,539,000	21.9
Kentucky	87	9	43,265,000	1,892,000	4.4
Ohio	26	4	16,658,000	2,688,000	16.1
Pennsylvania	99	8	52,602,000	3,075,000	5.8
Utah	5	2	2,987,000	96,000	3.2
Virginia	30	3	13,304,000	2,147,000	16.1
Washington	4	1	336,000	156,000	46.3
West Virginia	194	36	102,018,000	16,051,000	15.7
Other States	67	—	18,815,000	—	—
Total	593	88	304,028,000	31,942,000	10.5

TABLE IV—Thermal Drying of Bituminous Coal and Lignite At U. S., Mines by States, 1957

State	Number of thermal drying units	Grand total production, net tons	Total production where thermal drying was done, net tons	Net tons thermally dried	Percentage thermally dried	
					From total all mines	From mines that do drying
Illinois	40	46,993,000	12,411,000	3,298,000	7.0	26.6
Indiana	26	15,841,000	5,913,000	2,539,000	16.0	42.9
Kentucky	16	74,667,000	8,649,000	1,892,000	2.5	21.9
Ohio	13	36,862,000	6,857,000	2,688,000	7.3	39.2
Pennsylvania	21	85,365,000	6,593,000	3,075,000	3.6	46.6
Utah	2	6,858,000	1,278,000	96,000	1.4	7.5
Virginia	10	29,506,000	5,658,000	2,147,000	7.3	38.0
Washington	2	360,000	206,000	156,000	43.2	75.7
West Virginia	71	156,842,000	40,407,000	16,051,000	10.2	39.7
Other States	—	39,410,000	—	—	—	—
Total	201	492,704,000	87,972,000	31,942,000	6.5	36.3

coal or finer. A detailed report on dewatering and thermal drying by Orville R. Lyons is published in *Coal Preparation*, an AIME publication, 1950 edition, pp 648-715.

The total moisture content of wet-washed is made up of two components, inherent and surface moisture. Inherent moisture, in general, is that present in the coal in the seam. Surface moisture is that attached to the surface of the coal particles or retained in cracks and fissures other than the capillary openings in the coal substance itself.

Three principal methods of removing surface moisture from coal are (1) gravity drainage, (2) mechanical dewatering and (3) thermal drying. Generally, thermal drying is used on coals that cannot be readily dried by gravity drainage or mechanical means, such as screens, centrifuges and filters.

Annual reports submitted by bituminuos coal and lignite producers to the Bureau of Mines for 1957 included, for the first time, data on thermal drying of bituminous coal. These reports, "Bituminous Coal and Lignite Production and Mine Operation: Calendar Year 1957," Form 6-1401-A, included data on thermal drying of bituminous coal at the preparation plant only and did not include thermal drying at power plants and other industrial plants.

For the purpose of this report thermal driers have been arranged into six groups: (1) rotary driers, (2) screen driers, (3) vertical tray and cascade driers, (4) continuous carrier driers, (5) suspension or flash driers, including the fluidized-bed drier and (6) the multilouvre drier.

Table I lists the tonnage thermally dried in 1957 by type of drying equipment. A few producers that employed more than one type of thermal-drying equipment were not able to furnish exact figures by type. Estimates were made on the breakdown of tons dried, by type of equipment, at these plants.

Each thermal drier has been designed to handle a definite size range of coal. Table II shows the minimum and maximum top sizes handled and the size most commonly reported as thermally dried for the various types of driers in use at bitumunous coal mines in 1957. The size of feed data listed in this table are from reports submitted by bituminous coal producers and may not include all sizes that the driers will handle.

Comparison of bituminous coal thermally dried with that mechnically cleaned is given in Table III. The State of Washington had the greatest percentage (46%) of cleaned coal that was thermally dried in 1957. Indiana was second with 22%, compared with about 11% for the United States. More than one-third of the at the mines in 11 states that operated bituminous coal cleaning plants in 1957.

Thermal drying of bituminous coal by states in 1957 is given in Table IV. More than half of the total bituminous coal thermally dried was from West Virginia. Illinois was second, with 10% of that thermally dried, followed by Pennsylvania, Ohio and Indiana.

The total amount of bituminous coal thermally dried in 1957 amounted to 32 million tons, or approximately 7% of total production in the United States. More than one1third of the total production from mines having thermal-drying equipment was thermally dried.

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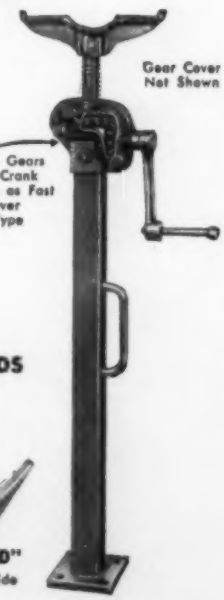
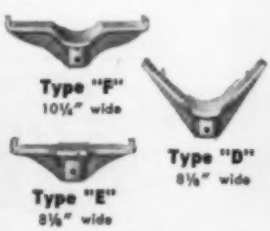


3 TYPES OF HEADS



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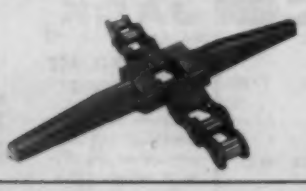

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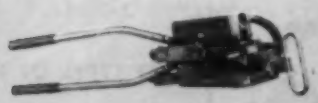

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A new mining pattern in low coal the JOY ROTOBUSTER

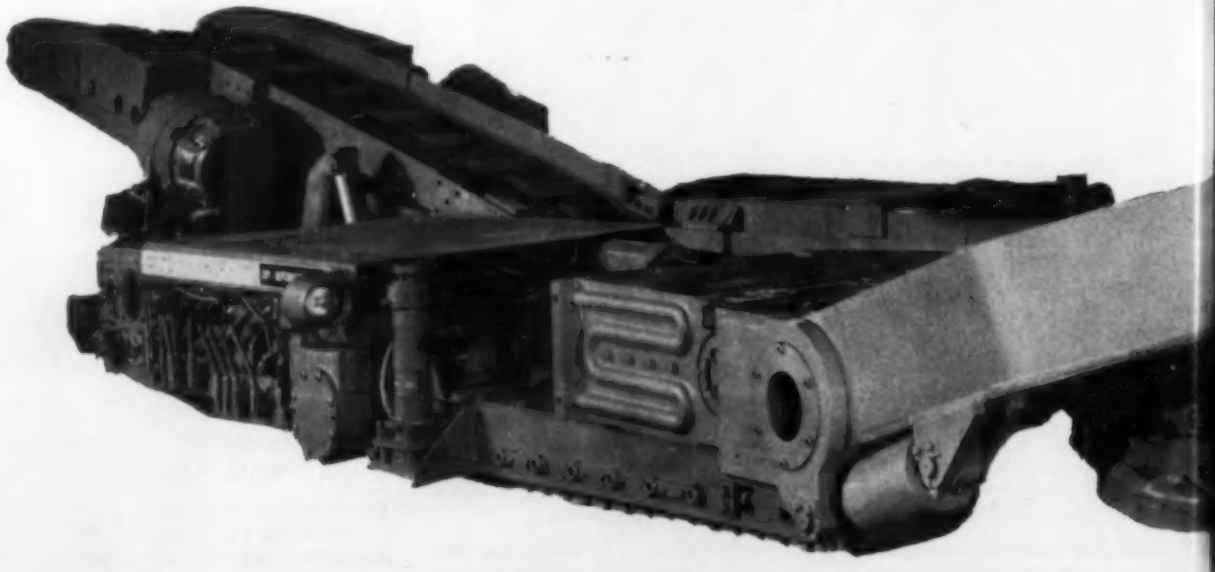
Here's a new kind of continuous miner designed for seams as low as 32 inches. The Joy Rotobuster works on a new and different mining principle to mine rooms 14 to 20 feet wide in seams 32 to 48 inches high.

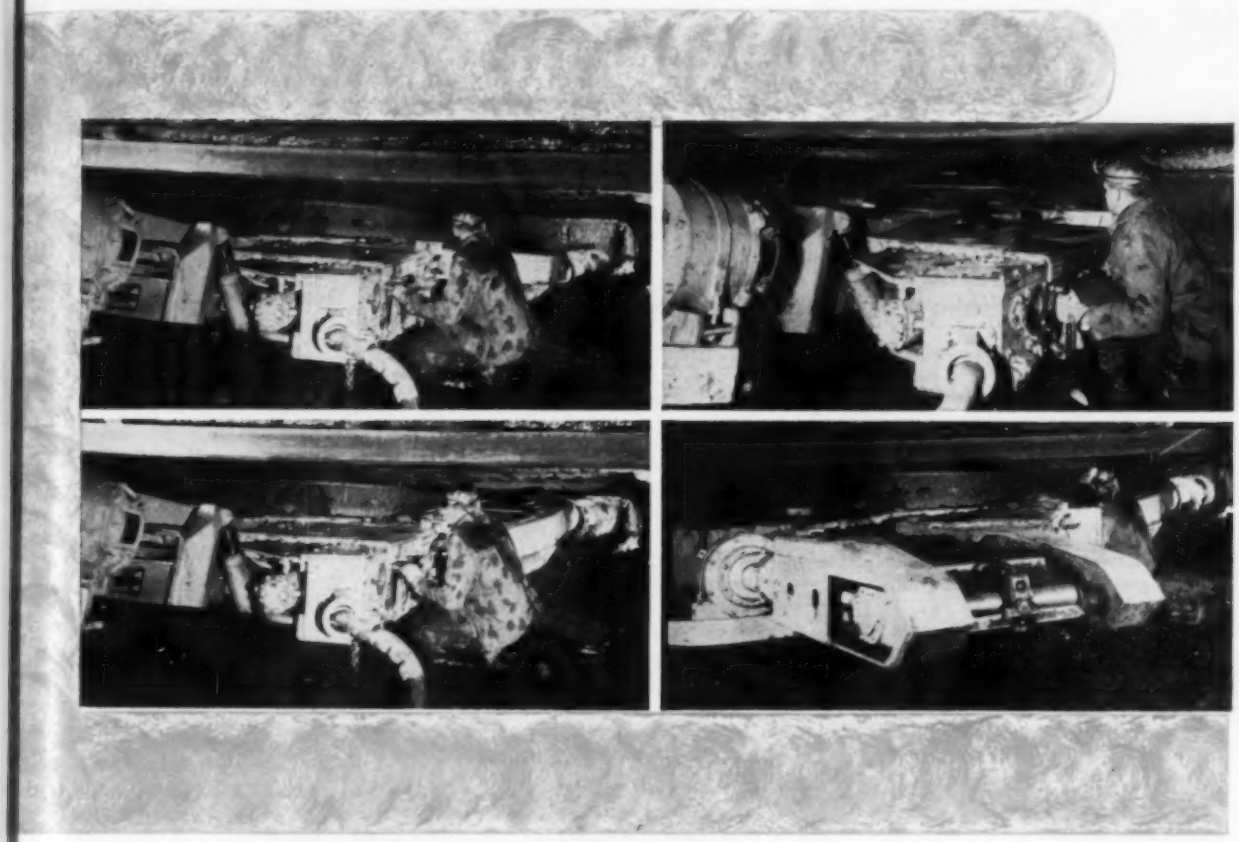
The Rotobuster works this way: the mining head bores into the coal, then sweeps sideways across the face breaking out the coal in its path. When the head reaches the opposite rib it shears upward, then begins a return sweep back across the face. This completes the mining cycle, and the Rotobuster begins a new cycle by sumping forward on its crawlers. Simple . . . and fast.

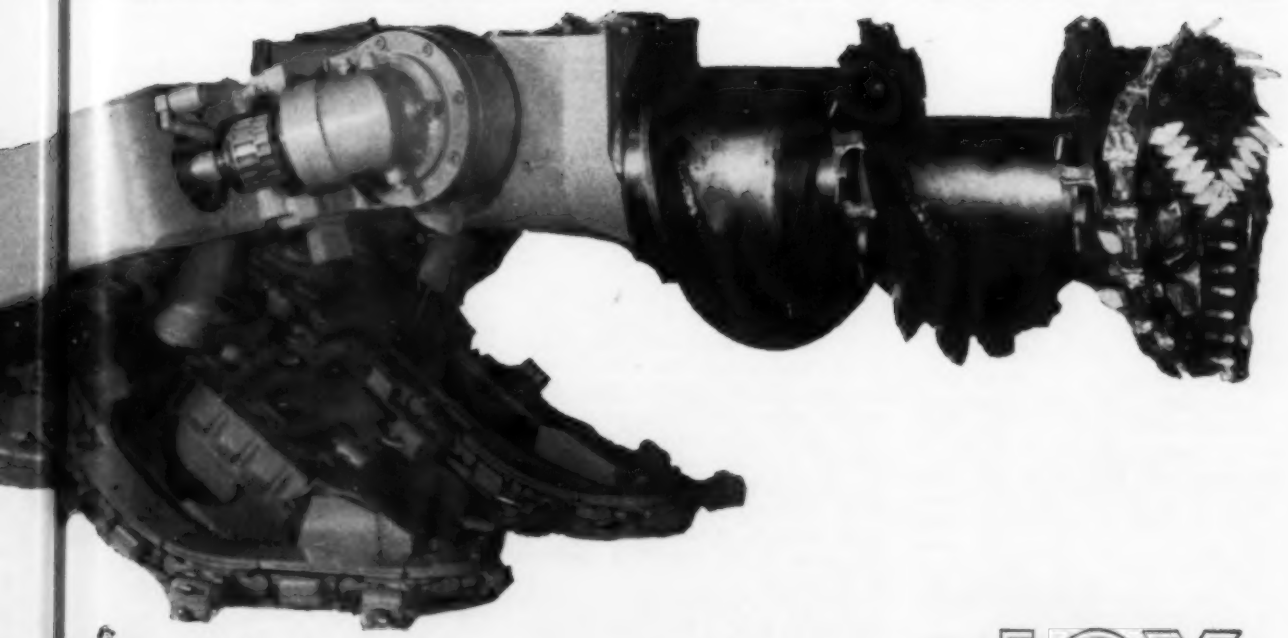
The operator follows the seam by selecting the cutting height and width as he mines each cycle—no need for adjustment. Fallen coal is swept into the conveyor by two loading chains. These chains and the front end of the conveyor swing with the mining head for complete and efficient cleanup.

The mining head, resembling a 26″ dia. auger, is actually two separate cutting devices rotating in opposite directions at different speeds about a common axis. In front is the end cutter that cuts a slot in the coal. The second element, an auger-like cutter, breaks the coal into the slot and moves it back to the conveyor.

The Rotobuster's head swings 45° to either side, and the conveyor also swings 45° to either side. This means unmatched maneuverability and versatility in driving crosscuts and mining wide rooms in low coal. For complete information on the Joy Rotobuster write for bulletin 322-1







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Continuous Mining

Face Ventilation and Dust Control With Continuous Miners, by John B. Kebblish, general superintendent, Mountaineer Coal Co., Fairmont, W. Va.

The use of boring-type continuous mining machines has made a substantial contribution to better roof control at Loveridge mine of Mountaineer Coal Co. in northern West Virginia. However, the problems of face ventilation have become more acute, inasmuch as the boring-type machines drive a narrow place, 12 ft 8 in wide, and the machine bulks large in the face area. Furthermore, the Pittsburgh seam in the area contains a generous sprinkling of sulfur inclusions which could provide sources of ignition.

The first approach was the use of line brattice, but even with 80,000 cfm at the crosscut, only 4,000 cfm reached the face. Several innovations were tried in attempts to make face ventilation effective using line brattice, but to no avail.

Experiments then were conducted jointly with USBM in the use of auxiliary fans and tubing. It was found that a 1½-hp fan with 12-in tubing was effective in emissions of 20 cfm of methane or less. An 18-fn fan with 18-in tubing, driven by a 5-hp motor, was more effective but there were difficulties in installation. The 12-in fan was blowing, the 18-in fan exhausting.

A wet-type dust collector was mounted on the machine, but again, the difficulties of adding tubing detracted from its merit. Perhaps a separate self-contained unit of this type would do the job. A hydraulically-operated fan, driven by the hydraulic circuits of the mining machine, was effective in delivering a blast of air to the face through 14 ft of 6-in tubing. This fan operates in combination with an auxiliary exhaust fan, thus providing the better dust-control action of the exhaust fan and the methane-moving features of the blower. Auxiliary fans and tubing, when properly used, offer more positive face ventilation.

Advances in Roof Control, by James T. Jones, assistant superintendent, Mather Collieries, Mather, Pa.

In roof control for continuous mining a definite forward step has been the idea of mounting roof-bolting equipment at the sides of ripper-type miners. Some systems employ the hydraulic roof jacks of the miner and steel beams to provide automatic safety posting to protect operator and bolters. In some instances it is possible for the roof-bolters to take care of line-brattice work.

Extending similar roof-bolting systems to boring-type miners is more complicated because these machines move ahead while mining. The difficulty was overcome through the development of satellite bolters. These units are movable with relation to the chassis of the mining machine, thus they can operate from a fixed position while the miner advances. Units employing this system are averaging 400 tons of clean coal per shift with crews of 7½ men while operating in 5-ft seams.

Considerable mining with boring-type machines is done in the Upper Freeport seam in central Pennsylvania. The top has a tendency to rip along the ribs, so rows of posts are set to provide support and warning. In the Lower Kittanning seam 30- or 36-in roof bolts are used, often in conjunction with posts.

In northern West Virginia, one operator depends upon the arched ribs left by a large boring-type miner to support the roof, and the practice has been successful.

Coal Transportation from Continuous Mining Equipment, by Bruce E. Duke, assistant to the manager, Bethlehem Mines Corp., Johnstown, Pa.

Conveyors of some sort, with or without bridge devices, are the most logical means of hauling coal away from continuous miners. Studies have been conducted on shuttle cars, extensible belts and cascade conveyors. Time studies at a mine in the Lower Kittanning seam showed that a continuous miner with two shuttle cars, at 2.18 tons per car, using two runways with room lengths of 350 ft, could utilize only one half or less of the available working time to mine coal.

Estimates were made of the time consumed at the face when using extensible belts, as follows: loading time, 69%; maneuvering, 7%; and delay time, 24%, including 30 min for extending the belt. A cascade conveyor showed distinct possibilities as a transportation medium in continuous mining. It has the advantage of being able to follow the mining machine wherever it goes.

An extensible belt and bridge unit were tried, but difficulties were encountered in moving the unit from room to room. Bethlehem Collieries recently started a system of bridge- and extensible-belt conveyors for hauling coal in a continuous-mining operation in an 84-in seam. The best shift tonnage to date is 490 tons, or 76 tons per man. This appears promising.

INDUSTRY MEETING
A Special COAL AGE Staff-Written Report

Underground Power

Are AC sections Practical in DC Mines? by James G. Wiley, electrical engineer, Rochester & Pittsburgh Coal Co., Indiana, Pa.

The use of AC equipment in existing DC mines is governed by various economic factors. These include:

1. Adaptability of the existing underground power system.
2. Use of existing equipment.
3. Cost of a second underground transmission system.
4. Equipment maintenance costs.
5. Improved safety features of alternating current power systems and equipment.

In an underground DC system little can be done toward the use of AC equipment without the expensive installation of a complete AC system. It may be more practical to extend surface high-voltage lines to appropriate locations and drill a borehole to provide entrance for a high-voltage system.

Rochester & Pittsburgh Coal Co., however, has equipped one section with AC and DC equipment. In this case, they wanted to use an AC continuous mining machine but had so much DC auxiliary equipment on hand that was in good condition that they decided to mix the two systems.

The ease of advancing AC powered equipment, lower equipment costs and lower power costs are some of the reasons why AC is gaining in popularity and why it will ultimately replace DC systems at the face.

In formal discussion Joseph B. Albasin, mechanical and electrical engineer, Youghiogheny & Ohio Coal Co., Martins Ferry, Ohio, related a similar experience where one section of all-AC equipment was installed in a DC mine. The purpose was to evaluate the advantages of AC underground. Power is distributed at 4,160 V and reduced to 440. Power and distribution centers are kept within 600 ft of the face. Mr. Albasin concluded by stating that the experimental section worked so well that the company's new mine is planned all AC.

Why We Decided to Use AC Power For Our New Thunderbird Mine, by L. E. Briscoe, electrical engineer, Ayrshire Collieries Corp., Indianapolis, Ind.

To determine the type of power, AC or DC, to be used underground for the new Thunderbird mine several decisions had to be made. These included:

1. Type of face equipment — conventional or continuous miners.
2. Method of transporting coal—belt or rail haulage.
3. System of transporting men and supplies—battery powered jeeps or rail haulage.

After considerable research and study the decisions were made in favor of (1) conventional face equipment, (2) belt haulage and (3) battery powered jeeps.

Once these decisions were made, the problem of power supply was simplified. The final decision was to install an all AC power system. The reasons are as follows:

1. First cost.
2. Safety against shock and fire hazards.
3. Maintenance.
4. Flexibility.
5. Efficiency.

The main surface substation at Thunderbird consists of two duplicate transformers each rated at 2,500/3,125 kva. Power is purchased from the utility at 67 kv and transformed to 4,160 V. The transformers are supplied with a 32-step load-tap-changing arrangement which gives automatic voltage regulation under load to maintain satisfactory face voltage underground. The main transformer secondary is connected wye and has a 48-ohm, 5-kv, 50-amp continuous ground resistor connected in the neutral circuit.

Experiences in High Voltage Distribution Underground, by John W. Looney, electrical engineer, Pocahontas Fuel Co., Pocahontas, Va.

As the mines of Pocahontas Fuel Co. were mechanized it became apparent that portable converting equipment should be kept close to the face. Therefore, the company changed its power distribution system from above-ground DC power-conversion installations to underground installations. For voltage regulation and convenience 13.2 kv was selected as the underground distribution voltage. Power enters the mine through boreholes. Each borehole or cable entrance is protected by a 600-amp oil circuit breaker using inverse-time overcurrent relays as well as instantaneous and inverse-time overcurrent relays for current differential protection.

During the course of the changeover, 90,000 ft of cable was installed. This 90,000 ft of cable, which has been in service from one to 4 yr, has resulted in only 12 power outages, eight of which were due to slate falls. To minimize such failures cables are preferably hung along the haulways. The watchword in the preparation and installation of cables at Pocahontas are patience and carefulness.

Advantages of Higher Utilization Voltages Underground, by James A. Erskine, electrical engineer, Eastern Gas & Fuel Associates, Pittsburgh, Pa.

With face equipment getting larger and larger, the time is coming when it will be advisable to raise present restrictions on utilization voltages in underground coal mines.

The problem of inadequate power is one of the easiest to solve. Transmission distance, wire size, voltage rating, etc., are factors which must be considered. In many cases going to higher utilization voltages will solve the problem. A 440 V AC system at the face will not, in the future, be sufficient to power machinery which will increase in horsepower. If utilization voltages are not raised, cables sizes on equipment will increase to the point where it will be impossible to handle them. It is suggested that face voltage be increased to 550 V.

Strip Mining

Multiple Seam Stripping, by O. E. May, manager, Paradise mine, Pittsburg & Midway Coal Mining Co., Drakesboro, Ky.

The elements of a good multiple-seam stripping job are as follows:

1. Make your plan of operation flexible. Be sure to have ways and means of doing all jobs in order and on time with some capacity to spare.
2. You must continually make detailed

TECHNICAL SESSION OFFICIALS—M. J. Ankeny (top left), USBM, Safety; J. F. Core, U. S. Steel, Continuous Mining; W. J. Crawford, Enos Coal, Stripping; R. W. Fox, North American, Equipment Maintenance; R. G. Heers, Kaiser Steel, Underground Power; A. E. Lamm (bottom left), Sunnyhill, Stripping; J. L. McQuade, Donegan Coal, Thin-Seam Mining; E. M. Pace, Inland Steel, Management and Cost Control; R. F. Wesner, Boone County Coal, Coal Preparation, and W. C. Jones, Jeddo-Highland Coal, chairman of floor committee.

plans of your pit work as far in advance as it takes all machines to pass a given point. You must be willing to change your plan as required.

3. An alert supervisory force is necessary for efficient multiple-seam stripping.

4. Plenty of transportation and communication are important. Pickup trucks with two-way radio will give the necessary close contact with stripping machines, shop, office, store room and preparation plant.

5. Learn to cooperate with your sales force. It takes close cooperation to produce and sell the right coal at the right time in the right quantity.

6. Management must be willing to accept some inefficiencies to gain the advantages of multiple-seam stripping.

Recent Applications of Wire-Line Coring Techniques in Coal Exploration, by M. J. Gleason, manager, Contract Drilling Div., E. J. Longyear Co., Minneapolis, Minn.

Basically, the wire-line coring technique differs from the conventional coring method in that a retractable inner tube is used. At the end of each core run, the core-laden inner tube assembly is hoisted to the surface through the drill string, as opposed to the conventional method wherein it is necessary to pull the entire drill string and core barrel.

The main advantages gained through the use of the wire-line coring technique are as follows:

1. Diamond bit, outer tube of core barrel and drill stem can be left in the hole until the bit has become unserviceable, or until the hole must be stabilized through the use of casing or cement.

2. In wire-line coring operations the attrition of the weaker strata exposed in the drill hole is minimized. Also, since the bit remains near the bottom between runs, drilling through caved material is eliminated.

3. Because of sturdy construction, life of the core barrel normally is much greater than that of a conventional core barrel.

4. Experience indicates that an experienced driller can be properly trained to operate the equipment in a matter of a few shifts.

5. Since it is possible to pull the inner tube and extract the core with a minimum of effort and time, short core runs in difficult coring ground can be made without increasing the cost beyond economical limits.

6. Drill hole inclination tests can be easily made through the inside of the drill string by lowering and retrieving the clinometer on the wire line.

7. When a drill stem becomes lodged in a drill hole and cannot be recovered by pulling and jacking methods, it can be recovered much easier.

8. Increased core recovery.

9. Reduced diamond costs.

Highwall Augering With a Twin Auger, by J. R. Karnap, general manager, Elm Development Co., Oak Hill, W. Va.

In July, 1957, a 24-in twin auger was introduced. This machine has made possible the profitable augering of thin seams of previously developed coal properties as well as the development of new properties.

The new auger unit is 34 ft long, 19 ft wide, 15 ft high and carries 22 12½-ft auger sections and two 24-in auger heads tied together by a steel bar connecting two tapered roller bearings. This twin auger has a maximum drilling depth of 150 ft and weights 26 tons. It is powered by two diesel engines. One 175-hp engine feeds the auger by a self-driven winch that pulls the carriage along its rail-mounted frame. A 100-hp engine drives a hydraulic system that operates the 30-in conveyor which carries the coal from the auger to the trucks, operates the overhead crane and jack lifts in the four legs.

Production from the twin auger is nearly double that obtained with a single auger the same size, with initial invest-

ment approximately one-third more.

The twin cutterheads work close enough together to permit the rib of coal above and between them to be removed during augering. Calculations show the total recovery to be increased by 10%.

Five men are employed to operate the twin auger each shift. Of these, one operates the facing dozer, one operates the carriage, one operates the hydraulic system and two handle the auger sections and operate the pull dozer at the end of each cycle.

The maximum depth the auger will drill is 150 ft; however, rolls and highwall conditions have cut our present average depth to 100 ft. The completion of each hole is a cycle and an average of 15 cycles are completed in 7¼ hr. Production averages 420 tons per shift, or 28 tons per cycle.

Use of Continuous Mining Equipment in Highwalls, by J. C. Forrest Jr., president, Harcliff Coal Co., Pittsburgh, Pa.

Punch mining with a continuous miner and extensible belt enables the Harcliff Coal Co. to recover coal which otherwise would be lost because of prohibitive mining costs. A Jeffrey 76AM Colmol makes a 9½-ft opening in the coal and cuts breakthroughs every 105 ft. Cutting breakthroughs is the most costly mining because of the small swing of the miner. A Joy extensible belt is teamed with the Colmol in driving to a depth of 1,000 ft.

Approximately $300,000 was spent on the following equipment: Jeffrey 76AM Colmol, Joy extensible belt, power source and cables.

Two important jobs in this type of mining are keeping the working places on sights and keeping the bits sharp on the cutting head. Sights are taken every 25 ft and bits are checked at each breakthrough.

After driving 1,000 ft the miner is backed out to a point where the last piece of belt was added. Then the outside men reel up the belt and the underground men throw the belt brackets into the breakthroughs where they are easily accessible as a new place is driven. When all of the conveyor is removed the Colmol is backed out. An eight-man crew drives 1,000 ft in two days.

Very little timbering is required but two posts are always set in each breakthrough. A 20-ft barrier pillar is left between working places at regular intervals to provide additional protection for the equipment.

Remote Control Highwall Mining, by J. W. Heimaster, bore mining department, Union Carbide Olefins Co., Div. of Union Carbide Corp., S. Charleston, W. Va.

The advantages of remotely controlled mining over conventional continuous mining are many. The depth to which holes can be drilled is theoretically unlimited but practical considerations probably will limit the depth to between 1,000 and 2,000 ft. Since the full seam is mined the recovery realized is many times that achieved by augers.

Operation is truly continuous since it is unnecessary to make breakthroughs, no time is lost adding belt sections, waiting on shuttle cars etc. The only delay is rebitting.

Because a hole is usually completed in 24 hr or less, weathering of the roof is negligible. No roof support is normally necessary because no men work underground. The same reasoning applies to ventilation.

Dust is no problem. Drainage is not necessary because the machine is sufficiently waterproof to tram through any water likely to accumulate in the relatively short time required to complete a hole.

The greatest advantage is in safety. With no men working underground, the hazards associated with such work are eliminated.

Another major advantage is the reduction in labor required. Only two men are required to mine and load into trucks an average of more than 400 tons of coal per shift, working in a 44- to 48-in seam.

The reduction in operating costs realized by the high production per manshift, the good recovery, and the elimination of roof control, ventilation and drainage costs makes the coal produced by this means competitive in cost with that produced by strip mining with huge power shovels, costing several million dollars each.

An agreement has recently been made with the Joy Mfg. Co. granting them an exclusive license to build and sell remotely controlled machines embodying our basic patents. Joy is currently redesigning the entire system for greater reliability, greater production and decreased maintenance.

Joy proposes to build an adjustable-height machine capable of mining seams varying in height from 36 to 48 in in a single pass. A 1,000-ft train of wide flight conveyors will be provided. The conveyors not in the hole will be stored on a helical runway surrounding the control center.

Safety

A Continuous Methane Monitoring System at the Working Face, Robert S. James, chief, Branch of Electrical-Mechanical Testing, USBM, Pittsburgh, Pa.

Several manufacturers and the USBM are convinced that a continuously monitoring methane-alarm and power-shutoff system can be built and at reasonable cost. As with any new product, there will be obstacles to overcome; but dependable working systems will emerge (*Coal Age*, June, 1959 p 144, p 148).

Mine Fires in Northern West Virginia, William O. Barnard Jr., general superintendent, Christopher Coal Co.

Analysis of the 28 coal mine fires in the Pittsburgh seam in northern West Virginia during the past 10 yr shows that 12 or 43% have been caused by electrical short circuits on equipment and 7 or 25% by falls on wires. Four or 14% of the others have involved belts; 3 or 11%, gob lines or outcroppings; and 2, or 7%, haulage equipment. Fifteen of the 28 were extinguished by direct means and 13 had to be sealed off.

The most important phase of controlling mine fires is fire prevention. But when a fire does occur, it should be fought promptly with material that is readily available and with men who are trained to take positive, direct action. If all else fails, the fire should be fought indirectly by (1) sealing the mine off so that it will die from lack of oxygen, or (2) by flooding the fire area.

Safety Problems Involved in Strip Mining, Eugene E. Quenon, director of safety, Peabody Coal Co.

Many normal hazards in strip mines become much more serious under adverse weather conditions, and, in addition, new ones are developed. Adverse weather conditions include sudden changes in weather such as heavy rains, zero temperatures, and surface thawing after long periods of freezing. Personnel trained in the art and

skill of stripping coal in all kinds of weather are of vital importance to the prevention of accidents.

Because of the seriousness of safety problems in a modern preparation plant, Peabody has built into each new plant certain features to assure safe and efficient operation. Modern equipment, however, does not eliminate the need for training personnel to think and work safely at all times.

Haulage safety depends almost entirely on competent drivers. Contributing factors include well-maintained trucks and haulageways, and obedience to traffic rules and regulations.

Increased use of ammonium nitrate explosives since 1955 has been a major factor in eliminating hazards inherent in the transport, handling and storing of nitro-glycerine explosives. But many other hazards attendant upon drilling and blasting operations—use of dynamite, overburden removal, etc.—must be carefully approached and supervised before maximum safety in these stripping functions is reached.

Electricity ranging in voltage from 110 to 6,900 V AC presents a serious shock and electrical burn hazard to the majority of employees at a mine, especially when conditions are wet. The use of insulated cable hooks and the wearing of insulated shoes will minimize these dangers. Also, employees should be instructed to call the mine electrician when electrical equipment needs repair, or when connecting or disconnecting power conductors. When employees realize the seriousness of high voltages, fewer chances are taken in working around power conductors.

The elimination of sub-standard safety conditions in strip pits is not far from reality. Progress will continue through the improvement of equipment and through the continued efforts of men and management to cooperate fully in accident prevention. A particularly vital need is to encourage employees and officials to work safely at all time and to take no unnecessary chances.

Fire Resistant Hydraulic Fluids for Coal Mines, A. S. Morrow, senior engineer—Industrial Products Application Dept., Shell Oil Co.

As a result of a cooperative development program spearheaded by the USBM, an economical fire-resistant hydraulic fluid is now available for coal mine applications. Its availability is significant because USBM data shows (1) that some 39 fires involved hydraulic equipment in the period 1952-58, and (2) that for every 25.2 tons of coal mechanically mined, approximately one gallon of hydraulic oil is consumed.

The fire-resistant hydraulic fluid is a water-in-oil emulsion type product which combines premium hydraulic oils with emulsifying agents and water, by a definite procedure. In essence, minute particles of water are surrounded by oil, and when the emulsion heats up to the ignition point, the water turns to steam, snuffing out the fire in an incipient stage.

It must be appreciated that fire-resistant hydraulic fluids are not identical to oils and therefore, must be handled in a somewhat different manner. Good maitnenance practice is very necessary. When used appropriately such fluids will result in improved safety, less downtime and increased production.

Much Can Be Done to Improve Coal Mine Safety, Dennis J. Keenan, vice president, Sterling Coal Co.

Safety programs have been adopted and used with a good measure of success. Each, however, has some weakness or missing link because it has not been projected as an engineering part of the total mining operation.

A sound and workable safety program should include careful study of all characteristics of the seam, the method of mining, the type of equipment used, methods of ventilation, transportation, drainage, and proximity to adjacent, overlaying or underlaying mines.

Vital also are (1) setting up a safety organization guided by a capable safety director and (2) adopting an educational plan for all employees and officials. The educational plan should include first aid training, accident prevention courses at each mine, and regular monthly safety meetings.

Each mine should use the inspection and advisory services of state and federal departments, including the USBM. Safety programs should be undertaken by several organizations to give the subject a varied approach and to keep up interest.

To improve coal mine safety, the safety engineer must sell his product every minute of every hour of every day to all employees of every mine; the departmental engineers should be the architects of safety planning; and supervisors should produce the end results.

Coal Preparation

Centrifuging Stoker Coal, by E. A. Watters Jr., chief engineer, Joanne Coal Co., Pittsburgh, Pa.

The ¼ x ¾ stoker coal constitutes about one-fourth of the total clean coal output of the preparation plant, or a little over 100 tph. Prior to the installation of the Bird-Humboldt centrifugal stoker drier a cut of this product of about 30 tph was fed to the fine coal conveying equipment for thermal drying, which was about all the tonnage that the conveying equipment could handle. The remaining 70 tph had to be dewatered in some manner. Because of the simplicity of the installation as well as the operating cost, it was decided to install a centrifugal stoker drier to effect the following results:

1. Reduce the moisture in slack coal to improve the Btu value for pricing.
2. To increase sales in the winter season by eliminating freezing in railroad cars without further treatment.
3. To develop further markets for ¼ x ¾ pea stoker for sale at a slight premium.

The Bird-Humboldt centrifuge has been in operation since the first of this year and to date there have been 40 bulk samples taken on both the feed and drier product. Total and inherent moisture were determined on each of these samples.

From some 40 different results obtained thus far, we believe this total moisture determination to be representative of the product obtained from the Bird-Humboldt centrifugal drier:

Total moisture	4.56%
Residual moisture	1.93%
Air-dry moisture	2.63%

The feed sample can vary considerably in total moisture, depending on the plant's screening and dewatering operation in order to obtain the desired moisture and screen analysis in the pea stoker coal. From the operation at Joanne, we believe the following to be a representative feed sample to the Bird-Humboldt drier:

Total moisture	6.34%
Residual moisture	2.39%
Air-dry moisture	3.95%

The machine has been operating since the first of the year and we have had no serious expenditures for repairs or downtime. The only part that has been replaced is the rubber ring at the top of the bowl. The expected screen life is about 2,500 hr and the machine has not been operating that long.

Froth Flotation—A Tool for Increased Profit, by W. L. McMorris, Jr., general manager of coal preparation, U. S. Steel Corp., Pittsburgh, Pa.

More and more companies are investigating the possibility of incorporating flotation in their preparation plants. Without the many advances in drying methods wet fine-cleaning processes would not be possible.

The two chief reasons why operators are interested in fine-coal cleaning and flotation are to maintain a competitive fuel cost and to prevent pollution. Another reason for upgrading the quality of coal is to increase the effective carbonization of metallurgical coal in steel making.

We are now getting more fines because of the changes in mining practices. Consequently, we must pay more attention to fine-coal recovery, particularly for coal which in the past frequently was pumped to waste. At many operations the coal pumped to waste can be recovered at a lower cost than additional coal can be mined. Froth flotation can be a tool for increased profit by recovering the extreme fines.

In the interest of conservation of natural resources we should be interested in preparing coal to make the best possible use of it. We cannot afford to use high-grade metallurgical coal for non-metallurgical purposes.

The Dutch States Mines Heavy Medium Cyclone Washing System, by Dr. C. Krijgsman.

So far 16 cyclone washing plants are in operation in seven different European countries, the total capacity being 1,400 tph. Ten more plants are under construction in Belgium, Rhodesia, South Africa, Brazil, Czechoslovakia and Germany with a total capacity of about 1,500 tph.

One of the great advantages of the cyclone washers as compared to other types of washeries is that the results are practically independent of variations in loads.

At the 6,500-tpd Wilhelmina washery the cyclone washer now in operation has replaced an old Rheolaveur washery. The Rheolaveur was making only two products, clean coal and shale. The cyclone washery is making clean coal, middlings and shale.

The clean coal produced by the cyclone washer is low in ash, as the coal has to be used for special purposes. Adding the middlings to the clean coal gives a product with an ash content about equal to that of the clean coal from the Rheolaveur. Refuse from the Rheolaveur contained 4% of product, over 1.45 specific gravity, the refuse of the cyclone washer only 0.2%. Total available slack coal was increased by about 17 tpd.

Apart from the coal a large amount of middlings was lost in the shale. Rheolaveur refuse contained 27.7% of product with a specific gravity below 2.2 with 35.2% ash. For the refuse of the cyclone washer this was only 6.6% with 52.2% ash.

The total power required for one of the newest cyclone washers making three products is 4.8 hp per ton of feed. Control of the medium is completely automatic. The medium can be kept constant, within a range of 0.003 in density.

The cyclone used in a washery mostly has a diameter of 20 in, a feed opening of 4 in, an overflow opening of 8½ in, and an underflow opening of 6 in. There is a practical rule that the maximum size through an opening should never exceed one-third of such opening. Because of blockages, the maximum size of coal that can be treated in a 20-in cyclone will be 1 5/16 in.

The Electrical Side of Coal Preparation Plant Design, by D. E. Hamilton, application engineer, industrial engineering section, General Electric Co., Schenectady, N. Y.

The increased cleaning required to provide coal which will meet present-day market requirements has greatly expanded the use of processing equipment in coal preparation plants. This expansion places increased emphasis on the selection of the electrical equipment to obtain the utmost in safety, reliability and performance. The various phases of the electrical ssytem should be considered early in the planning stages so that the location of the mechanical and electrical equipment may be properly coordinated.

In viewing the electrical equipment the following points should be carefully considered: total power requirements; power distribution equipment; motors; control equipment, and selectition of cable.

In summary, when considering a new coal preparation plant the following suggestions bear careful consideration:

1. Determine substation size, taking into account the short-circuit portective levels available in the control.

2. Select motor voltages on the basis of the economics of the power-distribution system and obtaining best life of motors.

3. Select controls having proper interrupting capacity and properly sequence for best overall plant efficiency.

4. Use solidly-grounded, low-voltage distribution to obtain maximum reliability of the power system.

5. Apply capacitors to improve power factor and reduce required substation size where the economics will justify their use.

6. Select cables to withstand the particular short-circuit level as well as for proper amperage and voltage levels.

Dust Collection in Preparation Plants, Henry F. Hebley, consulting engineer, Pittsburgh, Pa.

During the past 5 mo developments in federal and state legislation has been so fast that the attention of the coal industry must be called to the new proposals. Such legislation, if adopted, will seriously affect the cost of operating coal preparation plants.

New York, New Jersey and Connecticut recently have joined forces for interstate regulation of pollution and a similar bill is to be introduced in Pennsylvania.

The Pennsylvania proposal would appoint a state-wide advisory board made up of the secretaries of health, commerce, forest and waters, argiculture and mines, one public member, one industry member and a representative of local government. With this group, decisions would be based on medical rather than engineering opinions. If this law is passed the question arises as to what will be the effect on the design of preparation plants.

Dust can be reduced by enclosing rotary dumps and using water sprays at places where dust is generated. Some plants now are being built with crushing and screening facilities in separate buildings.

When sprays are used to eliminate the dust problem we sometimes exchange the dust problem for highly acid water which could cause a serious stream pollution problem.

Management and Cost Control

Positive Application of Industrial Engineering to Coal Mining, L. J. Prelaz, secretary, Coal Standards, Inc.

The coal mining industry has been slow to adopt industrial engineering principally because there has been no great need for this approach until recently. However, with labor and supply costs increasing, with competition stiffening within the industry, and with equipment becoming obsolete before the original cost is amortized, coal companies have used this new technique to advantage.

Warner Collieries started a successful cost-reduction program in 1952. Good results have been obtained because top management recognized the need for such a program, initiated it, and gave it full support; all levels of management from the superintendent down to the section foreman were trained to understand and administer new techniques; and an industrial engineering department was organized and trained to evaluate problems.

Basic functions of the industrial engineering department have consisted of measuring the potential productive capacity of coal mining equipment, determining production standards, evaluating and measuring the effectiveness of present and proposed mining methods, and studying old and new equipment to evaluate machine performance under different mining conditions. Also, the department set up a system of cost accounting and cost control to measure daily cost, production and wastes incurred.

Costs can be reduced by changing methods, equipment, etc., but the ultimate in cost reduction is only achieved through positive, effective application of industrial engineering techniques.

Using IBM Methods to Reduce Supply Costs, E. P. Bucklen, special engineer, Pocahontas Fuel Co.

An integrated data - processing system using IBM methods and machines has made considerable savings possible for the Pocahontas Fuel Co. The most spectacular saving has been on inventory investment. At one time, inventory was growing at a rapid rate. The growth was halted and investment was reduced to one-half.

Other savings have been made in purchasing. Purchase orders are now written on a weekly basis for the company as a whole, whereas it was done daily for individual collieries. Such bulk purchasing, based on knowledge of annual requirements, has resulted in price savings of 10 to 20%. This saving could have been accomplished by manual ordering methods but at least four more people would have been needed to do the job.

Detailed supply cost reports have provided a foundation on which to build a cost-reduction program. Not only do these reports make fixing of cost responsibility possible but they disclose where action is necessary to stay within objectives. Such action could include such things as elimination of waste, development of better methods, improvement of maintenance techniques, requests to suppliers and manufacturers for better materials, dissemination of pertinent information, etc. Action already taken has resulted in definite improvements on certain individual items.

An Industrial Engineer Looks at Cost Controls, Earl L. Petersen, chief industrial engineer, Paul Weir Co.

Cost reduction is a job that is never done and the industrial engineer's greatest contribution is his ability to bring the factors of industry — men, machines, materials and methods — together for profitable production.

To lead its competitor, a coal company must have an active program for cutting costs. To accomplish this, the specific objectives of such a program must be spelled out and the means by which they are to be realized must be detailed. There must be effective organization at all levels of management. Leadership must be of the calibre that makes every employee feel that he is part of the team. Good human relations is just good business and remember it must start at the top.

For cost control efforts to be successful, they must also include (1) well organized, efficient maintenance programs, and (2) a working relationship between first-line foremen and industrial engineers.

Costs can be reduced, and employee and equipment productivity invariably can be improved. Certainly, these must occur if the industry or any individual company is to continue profitable operation and be ever able to meet new competitive challenges. In seeking cost reduction, however, let us not discount any of the modern cost controls available to management. And, at the same time, let us not overlook, or even regard lightly, the many personnel factors—the attitudes and relationships upon which all real and lasting business success depends.

Selection of Supervisors, Harry M. Tibbs, administrative assistant, Truax-Traer Coal Co.

Participation by each company in a mining engineering scholarship program would help solve the industry's continuing problem of a shortage of qualified supervisory employees in underground coal mines.

Best immediate solution to the problem is to upgrade present supervisors by continuous on-the-job training, and by after-hours training in mining subjects, including safety and management as well as actual cost production.

Truax-Traer's experience indicates that technical supervisors such as safety directors and engineers do the best job of training in general mining, ventilation, and state mine laws and safety. Vocational education in special subjects such as electricity, machine shop, mathematics, mechanical drawing, and automotive and diesel mechanics can be conducted best through local schools and universities. Coal companies themselves frequently have effective programs covering management and industrial relations training.

There are several types of university scholarship programs, but the "cooperative" type, under which the student spends equal time in school and on the job, is growing in popularity.

Training Programs for Operation of New Equipment, Walter H. Fleming, supervisor of training—coal mines, Tennessee Coal & Iron Div., U. S. Steel Corp.

The success or failure of any type new equipment depends in a large measure upon proper instruction given supervisors, maintenance men and operators. The effectiveness of training can be measured by the performance of the new equipment.

All training programs for teaching operators and maintenance consist of five main parts: research, planning, preparation, presentation and follow-up.

From this basic program, miners may be taught to drive a team of oxen, to help a goat pull mine cars, or to teach men to operate a self-controlled, nuclear-powered, coal-mining machine of the future.

When a man is taught to do a job, he must be taught much more than the physical operation of the equipment. He needs to know the purpose of his work

3 new applications get longer life and minimum maintenance using Dodge pillow blocks with Timken® bearings

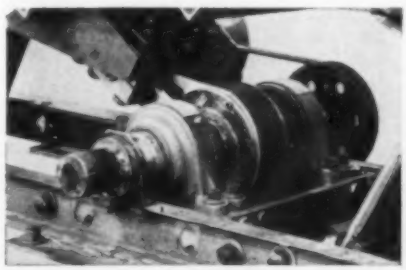
PICTURED below are three applications where Timken bearing equipped Dodge pillow blocks stay on the job with little attention under tough conditions. Their tapered design lets Timken® bearings take *both* radial and thrust loads in any combination. And full-line contact between rollers and races provides extra load-carrying capacity. Wear is reduced, maintenance is cut to the minimum.

Cutaway view shows the Dodge All-Steel pillow block with Timken bearing mounting. Of special design, the bearing has a tapered bore with self-aligning spherical outer surface —never needs adjustment.

Besides the All-Steel pillow block, other versatile Dodge pillow blocks with Timken tapered roller bearings are: Type "E", Double-Interlock, Type "C" and Special Duty. All are compact in design. Special thrust devices that take up extra space are not needed.

Timken bearings bring Betterness to any machines because Betterness rolls on Timken *tapered* roller bearings. So specify bearings trademarked "TIMKEN" for the machines you buy or build. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



Timken bearing-equipped Dodge All-Steel pillow block used in a vibrating conveyor.

Timken bearing-equipped Dodge Type "E" pillow block used in sand and gravel plant.

Timken bearing-equipped Dodge "Special Duty" pillow block as used on fine paper machine lineshafts.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS ROLL THE LOAD

and how it fits in with the overall organization. He must understand that by increasing his productivity, he will put his company in a better competitive position and that this, in turn, will add to his job security and better his standard of living.

When new equipment is added, top performance is expected. To get this, training, too, must be top-quality. The instruction and education given operators must show all members of the organization that top performance is the order of things, from top management right down through to the actual operation of equipment.

Equipment Maintenance

Training Maintenance Personnel, by A. R. Hood, superintendent, Warwick Mine, Duquesne Light Co., Greensboro, Pa.

Training maintenance personnel to troubleshoot electrical breakdowns was the major reason for establishing a formal training program for mechanics at Duquesne Light Co.'s Warwick mines. The need for better trained men became apparent as the mines converted to continuous mining machines.

A classroom near the outside shop was equipped with blackboards, desks, work benches, fluorescent lighting, warm air heating, AC and DC power, and plenty of floor area so that a mining machine could be brought into the classroom for practical demonstrations. The subject matter for the course was prepared by the master mechanic.

The course started with a short study of basic electricity, including Ohm's law, characteristics of series and parallel circuits, and the proper use of meters and instruments. The basic principles of electric motor operation, and the functions of relays, contactors, coils, and mercury switches were thoroughly studied. Each of these machine components were broken down so that their operation could be studied and their place in the operation of a machine would be more easily understood. Electrical symbols and diagrams were an important part of the training. Men were taught to trace control and motor circuits and to refer to electrical components by their diagram symbols. Use of test lights were given special attention.

During the training program true-false and multiple choice tests were given to help determine the progress of the class. At the conclusion of the first part of the course similar tests also were given. Using the results of the tests and at the election of the instructor, the men were paired off according to their needs and were brought back to the classroom for additional instructions. The second part of the course included instructions in welding. Those who merited it were given extra training in the functions and repair of electric motors.

Psychological tests were given to all class members to determine their intelligence quotient and mechanical aptitude. The ratings of each mechanic in these tests coincided very closely with ratings compiled from classroom performances. Because of these findings the company believes similar testing of job applicants would help considerably in determining their qualifications.

The cost of this training program including classroom, classroom fixtures, necessary teaching implements and wages was about $15,000. There is no way of determining the monetary return on this investment but maintenance supervisors have followed up this program and report that the working habits of these men indicate that they are much more capable of coping with electrical troubles, that they approach troubles with confidence and that they seldom find it necessary to call for help.

Training Maintenance Personnel, by C. B. Fulmer, superintendent, power and mechnical, Stonega Coke & Coal Co., Big Stone Gap, Va.

Faced with an acute shortage of men with the necessary training and experience in the maintenance of mining equipment, Stonega Coke & Coal, initiated a training program for men with no experience and also for those already employed as mechanics. A classroom was added to the electrical shop and supply house building with a seating capacity for 90 persons. It was equipped with projectors, screen, films, blackboards and test benches. Two complete 35-mm film courses in electricity and mechanics are used in the training course. The training program also included a plan for the selection of men to be trained for mine maintenance work. The applicant was required to fill out an application form giving his name, age, address, birthplace, marital status, education, work experience, military service, military and other special training, and three references. Personal interviews and mechanical comprehension tests also were given to determine his capabilities, intelligence, knowledge, and aptitude for mechanics.

Trainees were put through an 18-mo basic training period at the central machine shop. Training included rebuilding shuttle cars, loading machines and cutting machines. This gave trainees experience in mechanical, electrical and hydraulic work associated with mining equipment and also how equipment should be lubricated.

The training program is a sound way to develop and train new maintenance personnel and to further develop the quality of older men. A trained mechanic is one of the most essential men in mechanized mining.

Overhauling Mining Equipment, by W. R. Wood (top photo), electrical superintendent and P. C. Stull, supervisor of maintenance, Berwind-White Coal Mining Co., Windber, Pa. (Paper presented by Mr. Wood.)

The purpose of an overhaul program is to keep machines productive, improve machine performance and safety and reduce maintenance costs. Initially, Berwind-White set up a tempory overhaul shop to gain experience in overhauling and rebuilding mining equipment. After the program proved successful the company expanded shop facilities to accommodate three major equipment items at one time.

Records are kept on each machine. Efficiency of overhaul program is evaluated by data collected. For example, a machine can be expected to produce 300,000 tons before an overhaul is indicated. Records also show that when overhauls are performed by the company the cost is less. To completely overhaul a Colmol, for example, the cost of labor was $3,000 and material $17,000. Another overhaul job (Colmol) costs $4,500 labor and $8,500 material. The average costs of overhauling three 14-BU loaders was $1,500 for labor and $1,700 for material.

Some of the advantages of a company overhaul program are:

1. Lower overhaul costs.
2. Effective overhaul scheduling.
3. Make own decisions to reuse parts.
4. Closer supervision of alterations.
5. Mechanics have purpose and responsibility.
6. Learn the effects of equipment abuse.

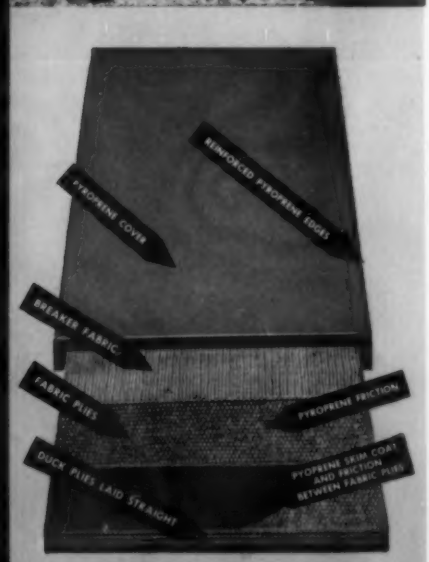
PYROPRENE*

*Acceptance designation: "Fire Resistant, U.S.B.M. No. 28-7"

Always on the move.....
1,500,000 tons per year

Huge sharp-edged pieces ride over ½ mile on the Acme-Hamilton Pyroprene Belt which is running on a Barber-Greene conveyor. Over a million and a half tons of coal a year travel on this belt. Trouble is non-existent. Proof-positive that Acme-Hamilton belts haul top capacity loads for longer periods with no loss of time, or maintenance.

Fire Resistant Pyroprene Compound, used in Acme-Hamilton U.S.B.M. accepted belts, will not feed or spread fire. The cover is Pyroprene; fabric plies and breaker fabric are sealed with Pyroprene before the belt is built. Cover has exceptional resistance to cutting, abrasion and gouging. Write Acme-Hamilton, Dept. CA-92.



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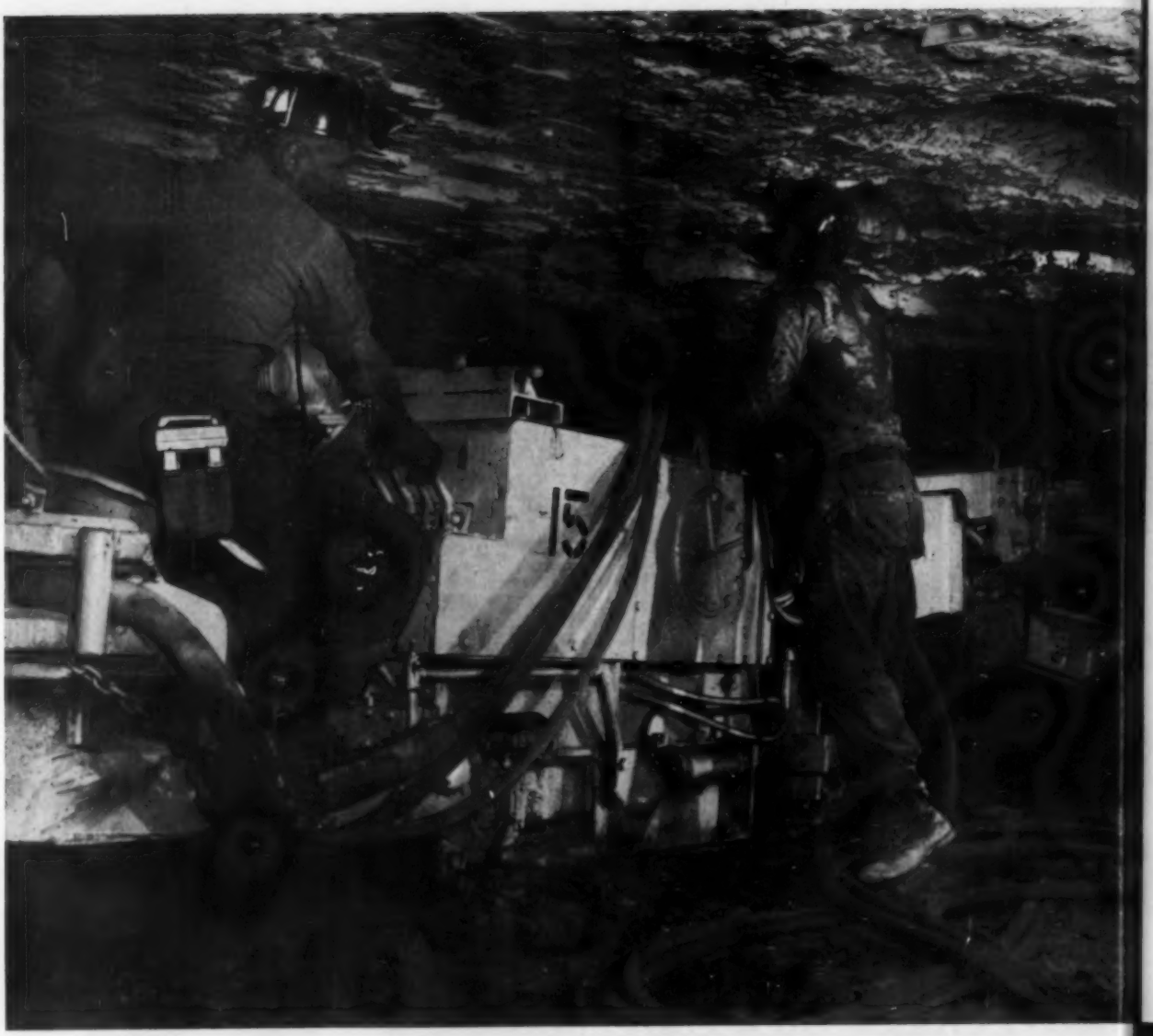

Flexibility, toughness and resistance to abrasion, oils, acids, alkalies and mine water are designed and built into these Tiger Brand Cables.

Keeps machines on the job. Tiger Brand cables take constant dragging over mine floors and around sharp corners.

USS Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

What's the difference in electrical wire and cable?

Even though electrical cables may look alike and start with some of the same materials, there's a *real difference* in the completed cables.

The difference in USS Tiger Brand Amerclad Cables results from a combination of research, engineering and construction. The development of better materials goes on constantly at American Steel & Wire. Insulation and jacketing compounds have been improved.

Better stranding designs and methods of stranding add years to cable life.

Amerclad Cables are protected by an outer jacket of Amerprene, an oil-resistant compound containing a high percentage of Neoprene. Before being vulcanized, an Amerclad Cable is encased in a substantial lead sheath that is afterward removed. The pressure developed within this rigid mold during the vulcanization process produces a dense, non-porous jacket that is highly resistant to abrasive wear.

Knowledge of severe field conditions obtained through AS&W sales engineers permits designing for special conditions.

Constant effort to control quality and improved methods of inspection assure a product of highest quality.

These are a few of the unseen plus values you get when you buy Tiger Brand Cables for your shovels, continuous miners, drills, shuttle cars and other equipment. For complete technical information, write for our free book, "Tiger Brand Amerclad Cord and Cable." American Steel & Wire, Dept. 933, 614 Superior Avenue, N. W., Cleveland 13, Ohio.

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United States Steel Export Company, Distributors Abroad

Maintenance of Continuous Mining Equipment Federal No. 1 Mine, by William Laird, superintendent, Eastern Gas & Fuel Associates, Grant Town, W. Va.

The effectiveness of continuous mining equipment depends on good maintenance. Federal No. 1 has six DC powered Goodman 400 continuous mining machines, one AC powered Goodman 400 and one DC Goodman 500.

To get the most out of these machines the company developed a maintenance program which sought to improve their performance by improving machine design. The author described and explained:

1. The McKinley entry driver.
2. Goodman 400 and 500 continuous mining machines.
3. Cutter-arm position.
4. Bit holders and bits.
5. Gear train wear.
6. Rotor shaft troubles.
7. Clutch experience and development.
8. Transmission gear reduction development.
9. Trim-chain guide and sprocket improvements.
10. Hydraulic equipment experience.

Preventive Maintenance in Low-Coal Mining, by Walter Crace, superintendent—power and maintenance, Princess Coals, Inc., Huntington, W. Va.

The maintenance and industrial engineering departments at Princess Coals have concentrated on the development of better maintenance practices. One of the first needs was to train men to perform the class of repair work a good maintenance program required. This problem was solved jointly by coal companies and the Mayo State Vocation School.

As soon as sufficient personnel were available, the company set up a unit-changeout program which included loading machines, shuttle cars and cutting machines. The purpose was to eliminate time-consuming major repairs and replacements during production shifts. The program was set up to change out the various units on each machine periodically. This frequency was established by the maintenance and industrial engineering departments.

A full-time clerk was assigned to do the paper work. Reports and records used are as follows:

1. Production and delay reports.
2. Equipment checklist.
3. Central shop rebuild forms.
4. Unit assembly tag.
5. Unit assembly operating repair summaries.
6. Unit assembly changeout schedule.
7. Monthly summaries of delay time.

There was a substantial initial cost in acquiring spare units, effecting method improvements and modernizing the shop. However, these expenditures can prove to be good investments if they provide a means to convert wasted delay time to production time. Diminishing coal heights have made production time increasingly valuable. Delays have been controlled to the extent that tonnage improvement can be attributed to less downtime. Using the same number of mechanized sections, the company produced 826,000 tons in 1952 and in 1958 over a million tons, an increase of 35.4%. In addition, maintenance supplies and parts were undergoing regular price increases. During the 1952-1958 period supply cost was held to 6c per ton.

Economic Aspects of Large Stripping Shovels, by J. P. McDowell, Supt., River King mine, Peabody Coal Co., Freeburg, Ill.

Strip mining has expanded because it could produce coal at less cost than underground mining. Both Marion Power Shovel Co. and Bucyrus-Erie have developed shovels with larger dippers and greater ranges than were formerly attainable, and the acceptance of these units by the industry is tangible evidence that they are performing an economical service. These new units have booms 140 to 165 ft long and dipper sizes range from 55 to 70 cu yd.

A Type 5320 shovel with 95-ft boom and 13-yd dipper removed a total of 4,322,930 cu yd of overburden in 1936 for an average of about 360,000 cu yd per month and 600 cu yd per digging hour. The average overburden depth was about 33.5 ft. From September 1957 to September 1958 the Type 5760 with 140-ft boom and 70-yd dipper removed a total of 18,984,730 cu yd of overburden for an average of 1,582,000 cu yd per month or 3,250 cu yd per hour. The average overburden depth was 61 ft.

When making straight cuts of equal width in level terrain the calculated maximum overburden depth that can be spoiled by the Type 5320 is about 48 ft. Under the same conditions the Type 5760 can handle 66 ft of overburden.

The Type 5760 can uncover coal at 24% higher ratio at the same cost as the Type 5320.

Other advantages of the large shovels are as follows:

1. The use of the larger shovel will enable you to extend your strip reserves in a given acreage and thereby obtain approximately 100% recovery rather than recover only 50% by augering or punch mining.

2. The larger shovel will enable you to have a larger one-pit mine equipped with efficient overall mining and preparation facilities.

3. The big mine with the larger shovel must have adequate long-time reserves to justify the expenditure and this condition is attractive to large contract users of coal.

4. The use of larger shovel units is a must for large-volume producers because of the dwindling reserves of shallow overburden and low-ratio coal.

5. These larger shovels are expensive, but when they can be amortized over longer terms they can be justified if all of the intangibles can be evaluated.

Economic Aspect of Large Stripping Draglines, by Lafe Stewart, chief engineer, Maumee Collieries Co., Terre Haute, Ind.

Use of larger draglines and shovels has been necessary to meet ever rising costs, but has also required a larger capital investment. The need for large investment has brought about mergers of producing companies in order to provide adequate reserves to cover the period over which the heavier investment is to be amortized.

There are certain conditions of both surface and coal topography which sometimes preclude the use of a shovel as a stripping unit. If the coal reserves lie in various scattered small bodies or if the coal seam itself is very rough or thin, selection of dragline is clearly indicated. The dragline moves overland with much less difficulty than the shovel, therefore substantial savings are possible in cases where reserves are not in one contiguous body but are separated into several tracts, each of which requires initial box cuts and development.

If the coal is very rough the dragline can remove all the overburden and prepare the coal for loading while the shovel, which travels on the coal, is frequently required to leave material for removal by the loader in order to maintain a level roadway.

Installed in new type chains, these rugged Kennametal U3RA cutter bits are the answer to rough cutting.

In extreme sulphur conditions . . .

KENNAMETAL* U3RA Bits boosted production and reduced bit cost

Irregular occurrence of sulphur lenses and balls causes a wide variety of mining conditions in the Pittsburgh No. 8 Seam. At one northern West Virginia mine, for example, bit cost for one section was only 1 cent a ton. Yet the mine average was 5½ cents. When they hit severe sulphur nests, the average jumped to 9 cents, with individual sections running as high as 67 cents. Production in those sections had to be stopped until a more economical method could be found.

On 1JCM miners, the company had been using standard carbide bits with a ½" x 1" shank. As would be expected, tip failures occurred more often than in normal cutting, but shank breakage was the big problem.

First, they tried lower cost steel bits with hardfaced tips. This lowered bit cost considerably, but it also lowered production . . . too much to become an accepted answer to the problem.

Next, they tried Kennametal U3RA Cutter Bits. This bit's stronger shank not only reduced shank breakage, but also reduced the frequency of tip failures. Bit costs immediately dropped from 9 to 7 cents a ton. Much time formerly lost for bit changes was converted to operating time . . . and production more than doubled.

Ask your Kennametal Representative or Distributor how Kennametal bits can improve *your* production. Let him help you select and actually test in your mine the Kennametal Bit best suited to your operating conditions. KENNAMETAL INC., Mining Tool Division, Bedford, Pa.

97208

COMPARATIVE BIT PERFORMANCE
Different bits—same section—severe sulphur

	Bits changed per shift	Tonnage per shift	Bit cost per ton
Standard carbide bit	200	225-240 tons	67¢
Hardfaced steel bit	300	175-218 tons	33¢
Kennametal U3RA bit	150	435-652 tons	27¢

*Trademark

INDUSTRY AND
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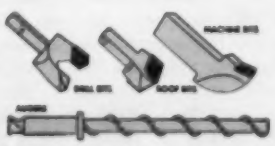


In the case of thin seams, a large shovel is often too heavy for the load-bearing capacity of the coal seam with a consequent periodic breakthrough and some loss of top coal.

Development of large draglines has lagged behind that of shovels. This is probably due to their limited use, except in the last few years, and also due to the fact that for many years there has been a tendency to consider the dragline as an auxiliary machine rather than a prime stripping unit. Draglines are now available with about 40-yd capacity and 200 to 220-ft dumping radius.

A point is approaching in the design of draglines where a complete redesign will be necessary if materially larger machines are required. One of the limitations concerns wire rope size, now limited to 3½ in.

Machine-Loading Blastholes With Ammonium Nitrate, by D. S. Blount, president, Raleigh Eagle Coal Co., Ameagle, W. Va.

We at Raleigh Eagle Coal Co. have been using for about 8 mo a blasting technique which, although not perfected, has helped to make it possible for us to remain in business. If you visited our property you would see a bulldozer pioneering along our top coal seam and following it would be a new "down the hole" drill boring 7-in holes 40 to 60 ft deep on 12-ft centers. You would also see that we have 60 to 80 ft of sandstone over the back of these holes.

We buy pre-oiled ammonium nitrate in 80-lb bags. This material is half prilled and half granular, and has been aged for seven days before delivery. The aging definitely helps the penetration of the oil and promotes complete detonation of the material. We also have some gain in density over all-prilled material.

From our storage point on the stripping we load enough ammonium nitrate and primers for a day's shooting onto a 10-ton truck on the back of which is mounted a Jetloader. This is an ammonium-nitrate blowing machine. At the scene of the blast, two men park the truck and assemble a core of primers in each hole.

Following this priming operation a small 105-cfm compressor is connected to the blow-loading machine and the two men start loading the ammonium nitrate. One man stays on the truck to handle the blow-loader and the nitrate while the other man goes from hole to hole with 100 ft of 1½-in I. D. plastic hose. The man inserts the hose to the back of the hole and calls for air to blow out mud and water. Then he signals for ammonium nitrate which is blown into the holes at the rate of one 80-lb bag in 15 sec. Actually counting the time of dumping the bag into the blower, turning on the air and then blowing the machine empty, it takes about 1 min per bag.

The material is blown with 40 to 50 lb pressure and packs solidly into the back of the hole—almost like concrete. We find we can get a third again as much blown material into a given length than cartridged material.

About 1 min is spent in withdrawing the hose and reinserting it. Our two men have no trouble at all in keeping up to schedule, and they have loaded and fired as much as 15,000 lb in a shift.

Power Distribution in Strip Mines at 7,200 Volts, by R. V. Bovenizer, electrical engineer, Hanna Coal Co., Cadiz, Ohio.

The ever-increasing capacity and digging power of stripping machines designed to remove 100 ft or more of overburden, and the attendant desire for operation at greater distances from the substation has created the necessity of using higher distribution voltages to handle the much larger blocks of energy needed to power these machines.

The necessity of using 7,200 V to power the larger shovels involves also the problem of power supply to loading shovels, drills and other auxiliary equipment in the pit.

The method chosen may be one of the following:

1. A complete separate 4,160-V power supply. This involves handling two high-voltage circuits in the pit.

2. To convert or purchase all auxiliary equipment to operate at 7,200 V. This would eliminate the need for two separate circuit voltages. Collector rings might be a problem when converting equipment to 7,200 V as greater clearances would be required. Transformation to a lower voltage at the auxiliary machines may be necessary where AC motors are too small to be designed economically for the higher voltage.

3. A combination system using both 1 and 2. The main feeder circuit would be 7,200 V with means of tapping the circuit to feed one or more 7,200 to 4,160 V substations.

The main factors to be considered in designing and operating a 7,200-V portable power distribution system are the same as those of any portable system. The system as a whole must: (1) be adequate and reliable, (2) have good voltage regulation, and (3) be safe.

Future Trends in Coal Mine Haulage, by T. G. Gerow, consulting engineer, Minneapolis, Minn.

Coal mine operators want to haul bigger loads farther, faster and at lower cost. Manufacturers want to supply such units if the market will support the necessary development at a profit and if technically they can develop satisfactory motors, transmissions, axles and tires for the bigger loads.

The major strip mine operators without exception report that they want higher capacity units. Eighty to 100-ton trucks are the popular demand. Designs contemplated range from the present bottom-dump semitrailer to the double-end double-powered and controlled shuttle unit. Hauls are lengthening and more speed is being asked.

Four hundred to 450 lb of gross load per horsepower appears to be the choice. For the ultimate in payload to gross load ratios, the turbocharged engines are being considered.

The operators are divided in their opinions on transmissions, probably influenced by present experience and equipment. Most seem to favor the straight transmission yet recognize the advantage of a properly designed torque converter. It would appear that the torque converter will necessarily become an integral part of the higher-horsepower and higher-tonnage units. Their design, however, must keep pace with the increase in horsepower demand.

The operators all favor the large-size single tire for many reasons and deplore the fact that most haulage trucks are under-tired and singles only available on certain models.

Bodies and frames will make use of the lightweight materials to increase the payload ratio. The design will be the conventional semitrailer with tandem-drive axles or, if the diesel-electric develops, three-axle design with independent drive at four wheels. For the very large loads the double-end shuttle units will probably be used.

Thin-Seam Mining

Improving Production With a Newly-Designed Transfer Feeder, by Myron Kok, vice president and general manager, Warner Collieries Co., Mammoth, W. Va.

A huge fan at a coal mine in western Pennsylvania is wired up by the company's chief outside electrician.

How one mine cut labor costs and installation time in half

A coal mine can't stop breathing.

That's why one coal company in western Pennsylvania maintains a constant vigil over its vital air supply with a meticulously engineered control system. And the nerves of that system are Rome's control cable.

Three fans—each rated at a capacity of 300,000 cfm—drive fresh air through sprawling miles of entryway at this mine site. The fans are remotely situated in the surrounding countryside. The most distant fan is about four miles from the mine entrance.

For the vital link between fans and control center, the mine's engineers chose 24,000 feet of control cable, with Rome Synthinol (weather- and moisture-resistant PVC) insulation and jacket, for an aerial installation. Winking lights at the control center tell engineers whether the fans are running at the right speed. Trouble, mechanical or electrical, in any fan starts a horn tooting so maintenance crews can be dispatched at once. If the fans were out of operation for a prolonged period, the potential danger would be tremendous. Gas could accumulate in the mine, jeopardizing hundreds of working miners.

"We've had experience with Rome's bore hole cable and other types of cable," says the chief outside electrician, "so I recommended Rome's control cable for this important job."

Installation cost halved

Installation time and cost were cut in half because of Rome's ability to deliver factory assembled self-supporting type cable. A crew of seven strung the first 16,000 feet of 12-conductor cable over rugged wooded and hilly terrain in only 14 working days.

Secret of this speedy installation is the messenger which Rome supplied already bound to the cable. It makes the cable ready for immediate aerial use, saves time and expense of on-the-job assembly.

You can save, too, with Rome control cable. Rome Cable manufactures various types of thermosetting and thermoplastic control cables to meet specific electrical, environmental, installation, and economic requirements. To get the right answer for your next control cable job, contact your nearest Rome Cable salesman.

MEET THE MAN

WHO'S DEDICATED TO YOUR JOB . . .

YOUR ROME CABLE SALESMAN

ROME CABLE

Considerable work has been done in develophigh - capacity loading machines and continuous miners and haulage systems. However, the intermediate link of shuttle cars to belts or mine cars has received less attention. The new Columbus-McKinnon Ratio-Feeder serves the basic function of providing surge capacity between shuttle car and main haulage to permit discharging the car in minimum time. This is important for this reason: If the discharge time of a 3.5-ton shuttle car is increased from 0.5 min to 1.0 min, in a section that normally produces 200 cars of material, the additional 0.5 min increase in discharge time can mean a loss of 100 min of working time. In a properly balanced face cycle this 100 min could mean the loss of 100 tons of material. Industrial-engineering analysis of these factors is extremely important in gaining higher productivity, which is a necessary forerunner to lower costs.

Early time studies of the new Ratio-Feeder in a section of Warner's Jensie mine showed a minimum increase of 6.5% in tonnage in advancing butt entries and 6.4% in retreating rooms. This indicated a 3-mo payback on the feeder. Further study predicates a gain of 27.5% by employing 6-ton TorKars with a larger 7-ton Ratio-Feeder.

Among the advantages of engineered feeders are (1) increased capacity from present conveyors, (2) possibilities for lower belt speeds, which can mean reduced cost per foot of belt, (3) better belt loading reduces belt maintenance, (4) jogging of shuttle-car conveyor is eliminated, thus reducing car maintenance, (5) elevating discharge booms can be eliminated, (6) construction of ramps, and in many instances, the brushing of roof or bottom can be eliminated.

New Concept in Mining, by Victor Hurley, president, Cedar Creek Mining Co., Oak Hill, W. Va.

The industry must search for new means, including both the equipment and the methods, of mining thin seams. One approach is that offered by the Long Co., known as "Full Dimension" mining. A feature of the Long system is the economical use of chain conveyors for intermediate transportation, with bridge conveyors and a new telescoping bridge carrier for face transportation. The system is applicable with either conventional or continuous mining methods.

An example is the method employed at Judy No. 14 mine, Crichton Coal & Coke Co., Indiana County, Pa., where two 76-AM Colmols, with bridge and chain conveyors, produce 350 tons per unit shift of clean coal from wide rooms. Main feature is the use of a single chain conveyor in the center of three openings, thus eliminating cross conveyors and conveyors in the outer openings of the set. Major advantages are that supplies can be more easily handled in the outer headings; substantial savings are made in conveyor parts and "panning up" time, ad ventilation is improved since permanent stoppings may be built in all breakthroughs except the last open crosscut. Bridge conveyors, pickup loaders and the Colmols provide the reach from outer openings to the conveyor in the center opening.

An added possibility in achieving higher productivity in thin seams is the use of the new Long Mobile Bridge Carrier. This is an extensible belt conveyor equipped to carry a bridge conveyor at each end. It provides a 150-ft telescoping feature to affect maximum maneuverability and flexibility in thin-seam mining. Methods are being worked out to permit its use in wide places, again using a single main chain conveyor in the center opening of a set of headings or rooms. The equipment lends itself to splitting blocks or pillars to get maximum recovery, plus the advantages listed for the Judy No. 14 system.

Conventional Mining in Thin Seams, by James D. Carter, mine superintendent, Osborne Mining Corp., Williamson, W. Va.

Operations at the company's Pond Creek mine prescribe the use of shuttle - car haulage from loading machines in a seam height of from 32 to 36 in. Major difficulties are low tonnage per cut, problems in getting full loads on shuttle cars, machine abuse through contact with the roof, bad conditions for making repairs and time losses in transporting men and supplies to face areas. Furthermore, to reach the tonnage that could be made from a 6-ft seam, twice the area must be opened, thus complicating the job of providing services, such as, ventilation, tracklaying, trolley installation and maintenance and so on.

Major emphasis at Osborne is to increase the toonage per cut by widening rooms to 40 ft and employing a longer cutter bar. Presently undergoing experiment is a 15-ft-long cutter bar. This will be used to make a cut in two passes, the first about 7 ft deep and the second to the full depth of the bar. The bar is swung through the first cut to remove bugdust in preparation for the second pass. Early results indicate appreciable time savings, since the cutter has less tramming and more operating time, and increased tonnage per cut. The increased operating time also is made available to following units in the cycle. In breaking the cut, long holes are drilled to the back on 8-ft centers. Half-length holes are drilled between these long holes to break up the front of the cut. Prior to this change in practice, large lumps at the front of a cut complicated loading. Another aid has been a change to solid tires on shuttle cars. This lowered the overall height of the cars to improve loading and reduce the possibility of contact with the roof. Elevators with the necessary surge capacity have been installed at loading points to improve shuttle-car trip time.

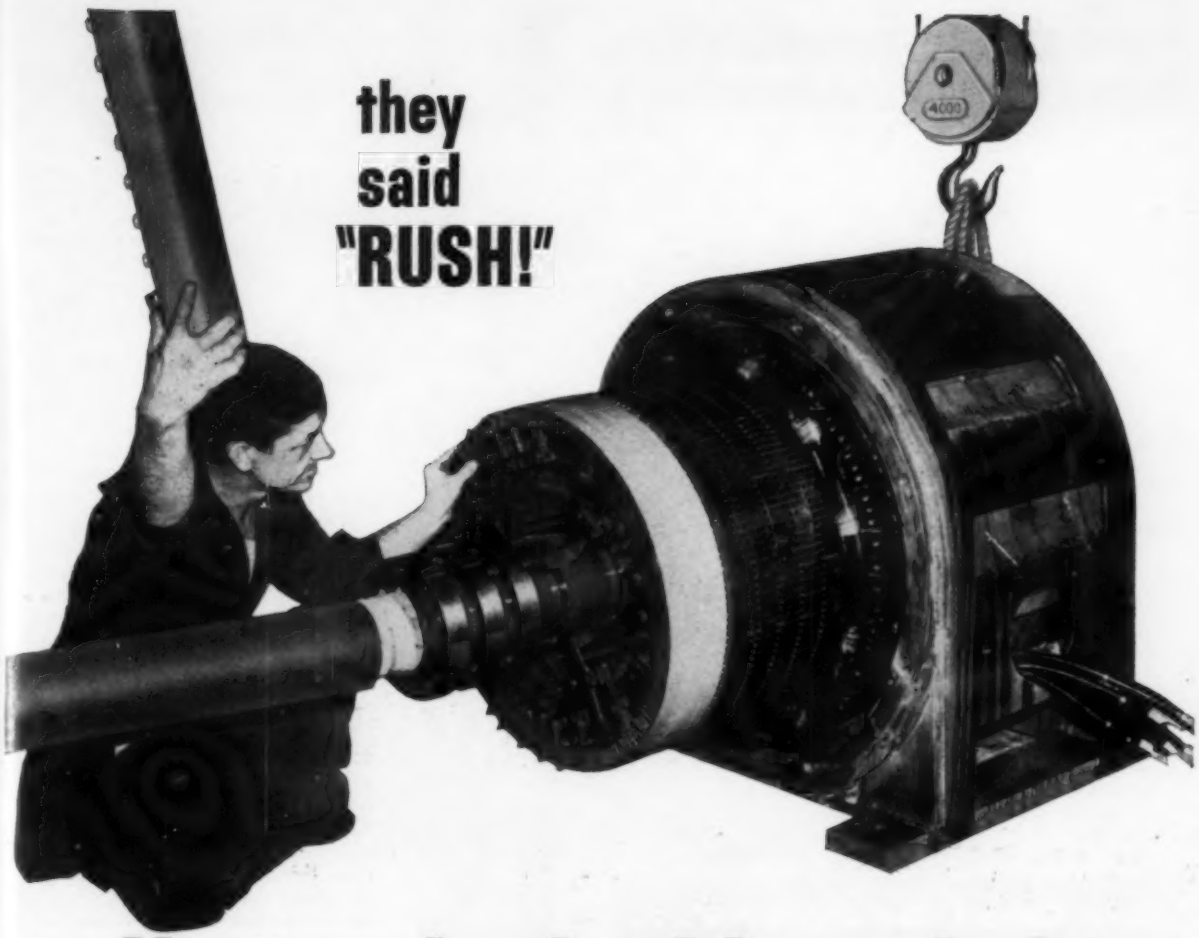
Roof Control in Thin Seams, by Stonie Barker Jr., mine superintendent, Island Creek Coal Co., Wyoming, W. Va.

Island Creek is operating in the 30-34-in Elkhorn No. 3 seam in Breathitt County, Ky., using a system in which loading machines discharge over bridge conveyors to chain conveyors in room work. One of the major problems that had to be worked out was a system of roof control that could be carried on without requiring an excessive number of men. The immediate roof consists of laminated layers of slate and shale from 4 to 10 ft thick, interspersed with streaks of coal up to ¼ in thick. Above this is a rider seam from 8 to 10 in thick.

Roof support consists of roof bolts with steel safety jacks at the face and posts and half-headers for permanent supports as the safety jacks are advanced. This system permits the machines to move with least trouble. For each cut of coal removed one row of 30-in bolts 5 ft apart is installed. Rows are 8 ft apart, one per cut, but a 60-in bolt is installed midway between rows along the centerline of the opening. This long bolt is installed by bending it at right angles, inserting it in the hole as far as it will go, then straightening the bolt to go in the rest of the way. The installation of a 60-in bolt takes about 90 sec, not including drilling the hole. Permanent timbers are set to within 1½ cuts of the face.

Posts are not recovered, but up to 80% of the bolts are reused, several times in the rooms, then permanently installed in the entries. Since changing to this system of operations in 1954 and 1955, production rates have steadily risen to a present level of over 35 tons of material per man in some sections.

Concluded on p 138



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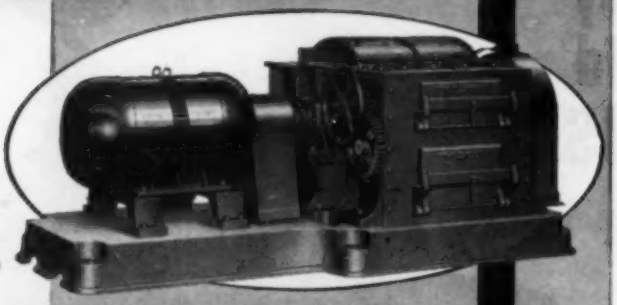

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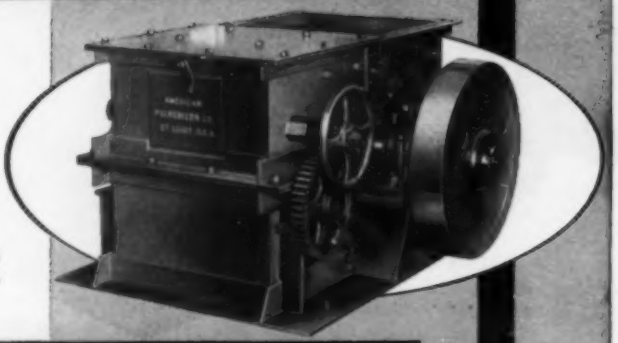

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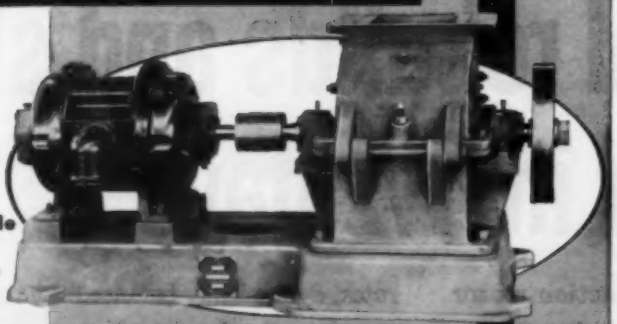

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Coal Show Report

Underground Augering Under Difficult Seam Conditions, by Tom N. Shattuck, mine superintendent, Wind Rock Coal & Coke Co., Oliver Springs, Tenn.

Natural conditions and the economics of the business led Wind Rock officials to a decision to try underground augering. Salem Tool Co. supplied an auger consisting of two parts, a power unit and the auger itself. The power unit carries two 50-hp DC motors and a 250-gal hydraulic oil tank. The connection to the augering unit is through 50-ft hoses. Both units are moved by the jack-and-skid arrangement used on surface augers. The system employs two cutting heads and one string of scrolls. The last completed hole serves as storage for the scrolls, which are withdrawn as needed to extend the string in a new hole.

The mining system requires the driving of three entries off the mains to a depth of 500 ft. These entries are 14 ft wide on 45-ft centers, and sets of three are 200 ft apart. The first auger hole is started 100 ft from the mains to provide a protective barrier. It is drilled from the auger entry and parallel to the mains. Succeeding holes leave 6-in ribs as the unit advances to the end of the 500-ft heading. Then it is moved to the outer heading on the other side and retreats toward the 100-ft limit from the mains. The barrier pillar can be augered from the mains as a last step in recovery.

Auger coal is transported via cross conveyor and modified bridge conveyor to shuttle cars. One car is a surge car. Production from each hole is about 25 tons. Five or six holes per shift are drilled by crew consisting of three men, two on the auger and one operating the shuttle cars. Recovery is about 50%.

Working two shifts per day, the auger will produce 200 tpd. Other benefits of underground augering are plainly evident. The danger of roof falls at the face is minimized. Futhermore the ability of the auger to lend itself to selective mining will enable many companies to mine seams which otherwise, due to roof or seam conditions, could not be recovered economically.

Some changes were necessary to strengthen equipment, some were made to speed up operating functions, some were made to aid operators and some were made to compensate for seam conditions. The major conclusion is that the auger releases coal for mining that could not be mined economically by other means.

Okocord Red Saddle twin Type W cable in action on loader and shuttle car at Intermountain Chemical Company's trona mine. Secret of Red Saddle's added strength and security against short circuits is the pre-formed, red neoprene protective wall between the conductors, and the compact construction in which all components are locked together for maximum ruggedness.

They've cut mining costs with tougher cables

"We've found that the longer life of Okocord cables means lower operating costs for us," says Jack Wilson, Maintenance Supervisor for Intermountain Chemical Company of Westvaco, Wyoming. "Our mining operation is almost 100% electrified. We need cables that can stand up to extreme abuse. Okocord mining cables have everything it takes to prevent work stoppages that waste man hours or immobilize expensive equipment." They're tough, highly flexible, and unaffected by oils, acids, alkalies or mine water.

On its shuttle cars—key to continuous, efficient operation—Intermountain finds that Okocord Red Saddle twin cable stands up best to high-speed reeling and unreeling . . . to being stretched tight against sharp tunnel wall corners . . . to frequent cable runovers . . . and to pulling and stretching. Says Mr. Wilson: "Okocord Red Saddle shuttle car cable minimizes internal shorts due to cable abuse."

There are Okocord quality cables to keep *your* mining equipment operating efficiently: shovels, drills, cutting equipment and other machinery. There are Okonite specialists ready and willing to help you in planning new cable systems. And there is an illustrated, 76-page booklet on mining cables that's free when you write for Bulletin CA-450, The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

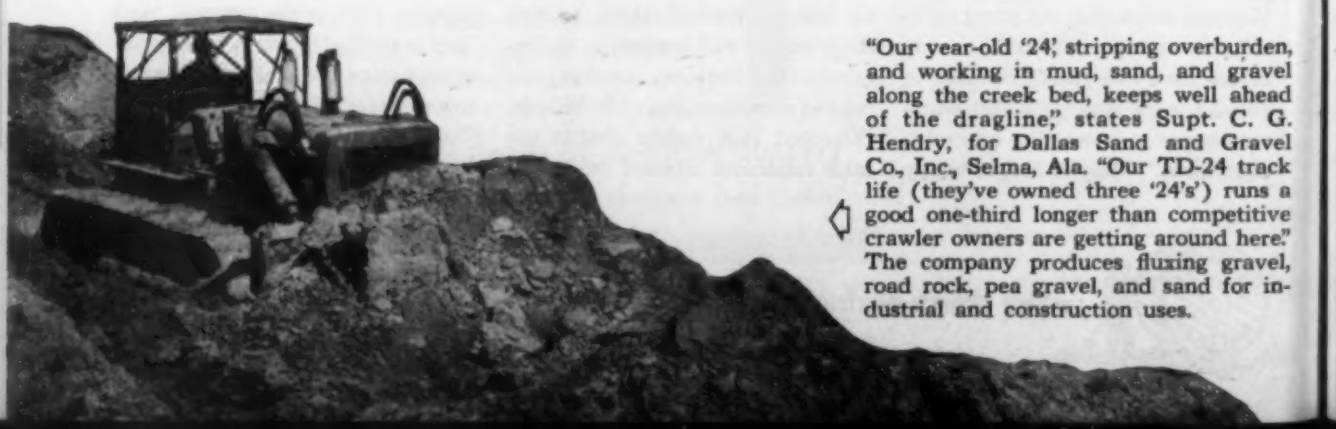
4218

"We've used International TD-24's on our job continuously for three years," reports Bobby Ikerd, for Ikerd and Bandy, Inc., Manchester, Ky. "Our first '24' has worked over 8,000 hours. We get good production with exceptionally long track life. Live track turning, planetary steering features, combined with hydraulic dozer, gives us a faster stripping operation in mountain terrain—plus operator safety advantages." Their 24's strip 30-foot earth-shale-rock overburden on 100-foot maximum push. Right: One of their "24's" rolling up production!

PLANET POWERED "24's"

hit stripping cost squeeze...with

"Planetary steering enables the TD-24 operator to cut more high-wall yardage per day, as live power on both tracks pulls out full dozer blades on a continuous move," declares Supt. Ken Ellis, Ford Mining Co., Charleston, W. Va. "The decelerator offers better tractor control. Our older TD-24 still has the same track system after 7,000 hours of work. Service like this sold us on our new '24.'" To support a coal-augering operation, their TD-24, shown, faces up to 300 lineal feet of bench daily—cutting a maximum depth highwall of 30 feet, in hard shale and sandstone.



"Our year-old '24,' stripping overburden, and working in mud, sand, and gravel along the creek bed, keeps well ahead of the dragline," states Supt. C. G. Hendry, for Dallas Sand and Gravel Co., Inc., Selma, Ala. "Our TD-24 track life (they've owned three '24's') runs a good one-third longer than competitive crawler owners are getting around here." The company produces fluxing gravel, road rock, pea gravel, and sand for industrial and construction uses.

"live" track steering...long track life!

"The TD-24 planetary steering design combined with the torque-converter has greatly reduced tractor maintenance in our type of operation," reports R. D. Baughman Coal Company, Brookville, Pa. "Live power on both tracks enables the operator to push larger loads, always keeping the dirt rolling regardless of terrain conditions. My operators especially like TD-24 ease of control." The Baughman Company strips up to 40 feet of shale, sand rock, and clay overburden from a 5-foot seam of coal.

See what's behind TD-24 ability to outdoze same-sized competitors, as much as 50%—and to give up to one-third greater track life than other makes, especially in tough conditions! See how exclusive Planet Power steering keeps paydirt on the move—doesn't spill your "extra profit" margin—eliminates "dead-track drag" in turns. Prove what it means to increase stripping production efficiency and cut upkeep with "24" capacity. See your International Construction Equipment Distributor for a demonstration.

International® Construction Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers and Bottom Dump Wagons... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.

Here's why a NEW 375-hp International CAN OUT-EARN ANY OTHER BIG

In the new 27 cu. yd. 495 Paywagon®, big earning advantages start with the new International DT-817 diesel engine. Forty-ton payloads highball upgrade or over rough and soft spots faster than ever behind the locomotive-like wallop of 375 turbocharged hp—more power per struck yard than any comparable wagon! Next, the "495" Paywagon's exclusive power-opened clamshell doors give positive dumping control—and retract parallel with hopper sides—"clean as a whistle" from wiper plate action! Pull-away clearance, to straddle 60"-high windrows, eliminates dumping delay! Too, the 495 Paywagon has new full 90° turning in either direction; new road-hugging design to gain top mph safely, out and back, at speeds up to 32.0 mph. Plus exclusive extra operator comfort and control features that reward you with extra production!

In the new 24 cu. yd. 495 Payscraper,® exclusive International DT-817 diesel power earning advantages team up with new cutting width and tapered bowl design—to heap-load faster than any other 3-axle scraper of its size. And it hauls at speeds up to 32.0 mph! The scraper's big 131" cutting width promotes fast dirt break-away, permits both unit and pusher to operate within the cut for best traction. Exclusive tapered bowl design boils dirt toward center, reducing side spillage, permitting positive, forced ejection even of sticky or frozen materials. More hp per struck yard than any competitive unit—wheel and bowl leveling adjustment—custom-designed cable control unit—full 90° turns—all team up to make the 495 Payscraper the top producer of its size class!

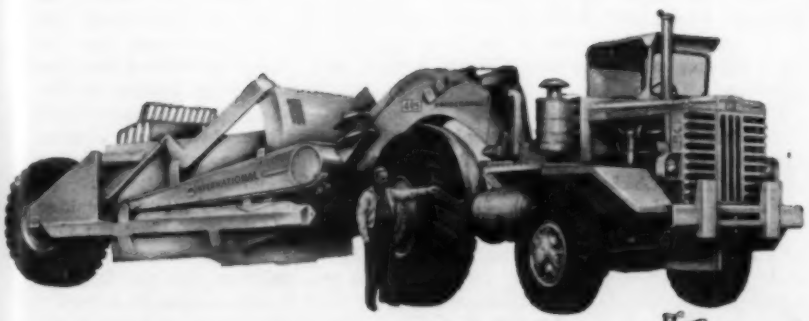
In the new 24 cu. yd. 295 Payscraper—you get the same big-capacity, high-torque engine that powers the 495's: the 375 hp DT-817! You get haul speeds up to 29.1 mph—matched with new automotive comfort and control features, that include a 16-adjustment seat. And the scraper unit of the 2-axle 295 is the same heap-loading, tapered bowl, wide-cut scraper featured in the 495 Payscraper!

Match any new International Earthmover against any similar equipment on your job or in your mind—for capacity, operating ease, low costs and net profit earning ability. See your International Construction Equipment Distributor!

Heaped, the new 375 hp International Paywagon highballs 40.5 cu. yd. (or 40.5 tons) as fast as 32.0 mph. Choose either 4-speed Power Shift or 9-speed constant mesh transmission drive.

Earthmover

WHEEL RIG ON YOUR JOB!



Controlled with new custom-designed cable control unit, the 375 hp International 495 Payscraper speeds 34 cu. yd. heaped loads up to 32.0 mph. Its apron can "gape" open as high as 98"—for sure ejection of all materials!

Positive-acting air brakes—16-adjustment spring hydraulic seat—unobstructed vision—flush-deck safety—power steering—all add up to production-boosting operator comfort and ease of control of the new 375 hp 295 Payscraper. Heaped capacity: 34 cu. yd. Max. speed: 29.1 mph.

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A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers and Bottom-Dump Wagons... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment.

SAFETY SPEAKERS—E. A. Berry (left), Mine Safety Appliance Co.; R. S. James, Bureau of Mines; L. H. Johnson, Bureau of Mines, session chairman; and Henry Ciechomski, Hanna Coal Co.

Continuous methane monitoring, effective accident prevention and electronic devices are themes at . . .

Western Pennsylvania Safety Engineering Conference

CONTINUOUS methane-monitoring systems, effective accident prevention and the use of television, electronic communication and electronic controls were topics at the coal mining session of the 34th annual Western Pennsylvania Safety Engineering Conference and exhibit held April 15 at the Penn-Sheraton hotel, Pittsburgh, Pa. Following are abstracts of the papers presented at the coal mining session.

Progress Report on Development of Continuous Methane Monitoring Systems, by R. S. James, chief, Branch of Electrical-Mechanical Testing, Bureau of Mines, Pittsburgh, Pa.

Several manufacturers and the Bureau of Mines are convinced that a continuously monitoring methane-alarm and power-shutoff system can be built practically and at reasonable cost. As with any new product, there will be obstacles to overcome along the way; but dependable working systems will emerge.

A manufacturer, in cooperation with a consulting research group, has developed a methane-detector alarm which uses the sonic principle based on speed of sound through different gases. Final refinements of the model unit should make it a practical component for application to a complete system.

Another company has developed a methane-detector-alarm which uses the catalytic oxidation of methane for indication. The company's engineers are now trying to finalize the design and expect to be ready for laboratory tests soon. This device seems to have all the "fail safe" features needed and should be able to do a good job.

A third company has completed the development of a device which sends a high frequency from the machine to the power source over the trailing cable. It will be able to serve as a trailing-cable fault warning, machine-frame voltage indicator and also to serve as the power shutoff when receiving a signal from the methane detector. This device already has received the acceptance of the Bureau for use as a machine "ground substitute."

Practical Procedures for Developing an Effective Accident-Prevention Program, by H. J. Ciechomski, superintendent, Glen Castle No. 6 mine, Hanna Coal Co., Cadiz, Ohio.

The proper attitude of top management toward safety is a "must" for an effective accident prevention program. If top management's preaching of safety is not preceded by its practice of safety, the preaching will fall on deaf ears.

It is the face foremen who must face the safety battle and it is through the efforts of these men that a good safety performance will actually be accomplished. Has top management passed on to these men its own enthusiasm for safety? Long before we can make a lot of hullabaloo about safety we must get down to the grass roots and develop men's attitudes.

If management's attitude toward the foremen is not right, it cannot expect the foremen's attitude toward the men to be right. If the management has not been able to sell the foreman that it believes, it certainly cannot expect the foreman to generate enthusiasm for safety himself so that he can pass the spark on to the men working for him. To the workmen, the foreman is the company. Unless proper relationships exist between these two groups of men, a mine cannot be on a firm foundation either efficiencywise or safetywise.

I believe the miners' safety committee will, in a large degree, reflect our attitude toward them. If we treat this committee as a necessary evil, that is pretty much what it will become. If, however, we welcome this group as being representatives of our employees, if we accept their advice and help and if we attempt to pass on to them our genuine enthusiasm for getting safety at our mine I feel their attitude will reflect this kind of treatment.

In my opinion a safety director or safety engineer should recognize first of all that his function is service. His job is to make the foreman's job easier, to consult with the foreman on general matters of safety and in particular matters of

INDUSTRY MEETING
A Special COAL AGE Staff-Written Report

individuals' faulty work habits. A safety man loses his value when he gets the idea that he is a policeman and becomes nothing more than a glorified tattletale. If a foreman can count on his safety engineer as being his helper and his ally and if they can honestly work together on safety, they can mutually benefit one another.

Safety awards, prizes, accident-prevention programs, first-aid training, etc. will have little effect on our safety program unless our attitudes are right. Every year each of our employees who has worked without a lost-time accident will receive an engraved award such as a lighter, electric alarm clock, engraved buckle and belt and so on. Each employee who has had no accidents during a fiscal year automatically receives a chance on a new automobile awarded annually at our company picnic. We periodically have safety slogan contests for which we award such prizes as an all-expense trip to New York for the winner and his wife. These contests are important from the standpoint of provoking talk about safety at home and the winning slogan helps us to publicize safety.

The Use of Television, Electronic Communication and Electronic Controls to Promote Safety and Increase Productivity in Coal Mines, by **E. A. Berry,** electronics engineer, Mine Safety Appliances Co., Pittsburgh, Pa.

The mining industry is a materials handling problem employing a very wide and diversified field of highly specialized equipment, scattered over a relatively large area in comparison to a compact manufacturing plant. The application of electronics would encompass two fields of activity insofar as mining is concerned. Field No. 1 would cover local or immediate control, indication and detection of information in the immediate vicinity of the particular machine, piece of equipment or scene of activity. These devices consist of detection instruments and indication devices for the control and sensing of level control, pressure control, temperature control, proximity, explosive gases, toxic gases, fire direction, switching, starting, stopping, speedup, slow down and selection of an alternate action.

The second field of activity will involve control of any activity from the first field to some central point or specifically, one control point. This will be done by a combination of components into systems to provide supervisory control equipment, telemetry, television and communication. Instruments are now available and have been available for a number of years to work out the above applications.

All that is required is to put these components together into systems. The day is fast approaching when mining men will consider these systems as carefully and plan them as well as power, transportation and mining systems.

We can build bigger and better machines, move and handle greater masses of material, do all the complex things demanded of modern mining methods in a bigger and better way, but we cannot endow these machines and methods with the ability to see, to talk or control themselves. We can, however, extend the ability of one man to see, to control or to transmit information of many machines or processes at will through the use of electronics.

In many cases where electronic equipment has been installed, it has paid for itself in less than a year and at the most in 2 yr. We believe this trend will accelerate at a much faster pace in the mining industry than any other industry because anyone engaged in the mining industry today can afford to invest a minimum of $30,000 in equipment to displace the services of one man at the operation.

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It's a matter of record...that STAMLER offers you the One and Only TIME PROVEN, TONNAGE PROVEN Car Spotter

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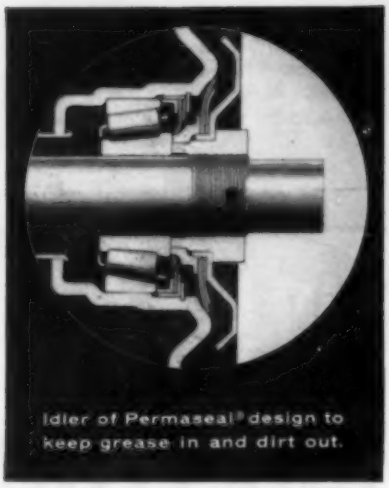
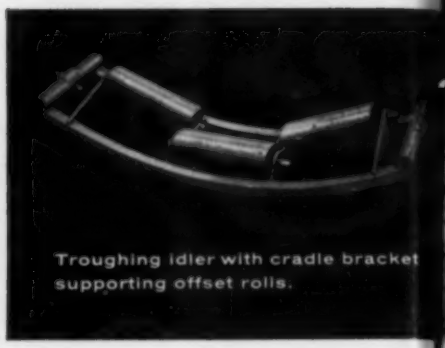
Salt Lake City, Utah

Troughing idler made up of cradle bracket with catenary rolls.



Idler of Permaseal® design to keep grease in and dirt out.



Troughing idler with cradle bracket supporting offset rolls.

To get extra value—cut operating costs

JEFFREY BELT CONVEYORS

(Wire Rope Type)

have these advantages...

Low first cost—Easy and economical to set up with fewer parts; need no belt training idlers; intermediate sections require no cover plates; two parallel wire ropes replace heavy rigid type angles or channel side frames.

Low operating cost—Fewer components to handle or transport saves time in extending or retracting belt conveyors; means less clean-up time because troughing contour of belt prevents spillage.

Movable and flexible—The lightweight design makes it easy to quickly extend or retract conveyor. Idlers can be moved or changed to suit material or mine condition. It's a simple task to change spacing of troughing idlers and stands carrying return idlers.

Long belt life—Lasts longer as load impact is absorbed by spring effect of wire ropes when load passes over troughing idlers.

Permaseal® idlers—Have Timken tapered roller bearings protected by two flexible diaphragm seals. Inner seal retains lubricant. Outer seal keeps out dirt. Permaseal idlers prelubricated for years of maintenance-free service.

Rope clamp for cradle bracket—Rope clamps with "no loss" tapered locking pins prevent creeping. The two parallel wire ropes are supported and spaced by strong, lightweight stands placed at intervals of approximately 20'. Cradle brackets and support stands hold ropes parallel. No separate spreader required.

Versatility—These conveyors can be used above or below ground to handle coal, salt, gypsum and iron ore. Idler rolls mounted in a cradle may be of the offset type, which permits removing or replacing individual rolls or of the catenary type. The catenary rolls are in line and connected by rivet chain links. This hinged joint arrangement causes the belt to take a troughing contour to suit heavy or light loads. Full width return rolls are used.

Send for bulletin 948 for more details. The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.

Rope clamp over the wire rope with a "no loss" tapered locking pin to secure the rope.

A 150-foot extension can be extended or retracted in less than an hour... no loss of production time with between-shifts extension of Jeffrey belt conveyor.

JEFFREY

MINING · CONVEYING · PROCESSING EQUIPMENT...

TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

PREPARATION—C. R. Bourland (left), The New River Co., session chairman; M. W. Mellor, McNally-Pittsburg Mfg. Co.; Mathew Turkovich, Island Creek Coal Co.; Wendel Bearce, Hanna Coal Co.; Robert Grimm, Inland Steel Co.; and D. H. Davis, Consolidation Coal Co., moderator.

HOISTING, HAULAGE—Eugene Ruttle (left), Mathies Coal Co.; Stephen Krickovic, Eastern Gas & Fuel Associates; Stephen Canonico, Clinchfield Coal Co., session chairman; Neil Robinson, moderator; William Husk, West Kentucky Coal Co.; and W. H. Poundstone, Christopher Coal Co.

Mine development, preparation, safety and haulage studied at . . .

W. Va. CMI—AIME Joint Meeting

OVER 260 of the coal industry's top operating and engineering personnel participated in a lively exchange of ideas at the joint meeting of the West Virginia Coal Mining Institute, Central Appalachian Section, Pittsburgh Section and Coal Division, AIME, Morgantown, W. Va., April 17 and 18. Topics included planning and developing a new mine, fine-coal preparation, continuous methane-monitoring systems, skip hoisting and haulage.

Crawford L. Wilson, director, West Virginia Department of Mines, Charleston, was chairman of the Friday morning session and H. E. Mauck, general superintendent, Olga Coal Co., Coalwood, was co-chairman. C. R. Bourland, president, The New River Company, Mt. Hope, served as chairman of the Friday afternoon session and D. H. Davis, Consolidation Coal Co., Pittsburgh, was moderator of the preparation symposium. Stephen Canonico, vice president, Clinchfield Coal Co., Clarksburg, served as chairman of the Saturday morning session and Neil Robinson, consulting engineer, was moderator of the haulage symposium.

Edward G. Fox, president, Bituminous Coal Operator's Association, spoke at Friday noon luncheon on coal wages, productivity and prices. At the Friday banquet S. M. Cassidy, vice president, Consolidation Coal Co., Pittsburgh, presented the Old Timers Club Award to Louis Murphy, West Virginia University mining engineering senior. Elvis J. Stahr Jr., president, West Virginia University, and guest speaker was introduced by R. E. Solvati, president, Island Creek Coal Co.

Following are abstracts of all papers.

INDUSTRY MEETING
A Special COAL AGE Staff-Written Report

Progress Report, West Virginia Mapping Program, by **Dr. Paul H. Price,** state geologist, West Virginia Economic and Geological Survey, Morgantown, W. Va.

In 1897 there were no good maps of the state of West Virginia. Now the state is the best mapped in the country. Early topographic work began in 1900 along the Ohio River. In recent years a need was felt for new topographic maps and in 1954 aerial photographs were taken in some major areas and new maps were discussed. A group of men from the various state organizations

met to decide where new mapping was most needed. A sum of $100,000 was appropriated for the work which began in 1956. Each year since then $100,000 has been spent on making new maps. If progress is to continue in mapping it will be necessary to carry on the program now under way.

Planning and Developing Moss No. 3 Mine, by William Stapleton, division superintendent, Clinchfield Coal Co., Dante, Va.

Moss No. 3 mine operates in the thick Tiller seam which occurs in the Norton Formation of the Pennsylvanian series where the Nos. 4 and 5 coals are so close together they form one seam 10 to 18 ft thick. The area allocated to Moss No. 3 covers 15 sq mi and contains 100,000,000 tons of coal.

To supplement original information about the coal seam, Clinchfield checked truck mines in the general area to get information on mining conditions. These openings also were a source of samples. In 1956 the company started an intensive program of prospecting and testing, including experimental mining.

Management's original idea on how to mine the 10-to 18-ft coal was to use conventional equipment in full-seam mining. Nothing happened during experimental to indicate that the conventional machines could not do the job if they were rugged and had sufficient capacity. As a result, the company negotiated with the manufacturers to get equipment capable of producing 1,500 tons of raw coal per shift with a 10-man crew.

To insure that the ultimate output of 20,000 to 25,000 tons of clean coal per day could be mined with a minimum of effort, top management decided to tap the seam at the outcrop with four portals. The four portals are identified as A, B, C and D. The A and B openings are on opposite sides of Tiller Fork and the C and D portals are on opposite banks of Cane Creek. Each of the four openings has three producing sections mining coal two shifts per day.

Section equipment includes one Joy 15-BU loader, specially designed for Moss No. 3; two 15-SC shuttle cars; one 10-RU cutter with 11-ft bar; one CD-41 self-propelled coal drill; and one Acme specially designed roof-bolter. The bolter has built-in adjustable safety jacks to protect the men while bolting, can be leveled, trammed or held on a 15% grade and is self-propelled.

Since the company wanted to standardize methods and equipment, all-belt haulage was chosen for all openings. Rope-frame units were chosen for all underground conveyors to cushion the lumps of coal and rock expected from the thick seam. Goodman 48-in units carry coal in all mains and Jeffrey and Joy units transport coal in the panels.

OLD TIMERS AWARD is presented to Louis Murphy (standing, with Mrs. Murphy), West Virginia University mining engineering senior, by S. M. Cassidy, vice president Consolidation Coal Co., Pittsburgh, Pa. and member of Old Timers Club.

Coal is fed to the panel belts by a Columbus-McKinnon Ratio Feeder that enables the shuttle car to discharge in 45 sec, distributes the coal evenly onto the belt and also protects the belt.

To link the mine portals with the preparation plant at Carbo required construction of 31 mi of track and driving an 8,240-ft tunnel through Sandy Ridge. At the preparation plant coal is unloaded by a rotary dump and carried to a 2,500-ton bin after reduction in a crusher. Cleaning facilities include two-stage heavy-media washing for coarse coal, three-product tabling of fines, mechanical and thermal drying.

A Continuous Methane Monitoring System, by R. S. James, U. S. Bureau of Mines, Pittsburgh, Pa.

With increased rates of production and supergassy mining in the offing today, we have a constant explosion hazard. All the advances in technology and instrumentation of our time have failed to provide a solution to the gas-explosion hazard.

The idea of a continuously monitoring methane-detector alarm system was first proposed by Marling J. Ankeny, director, Bureau of Mines, Feb. 12, 1958, at a meeting in Pittsburgh attended by member of the mining and electrical industry, representatives of the UMWA and coal operators' associations. The director appealed to this group to design and develop a system that could be attached to machines used at the face.

The Bureau is conducting a literature survey on past and present methods of detecting methane, as well as searching for new ideas in detection. One company has completed a breadboard model of a sonic-type methane alarm, operation of which is based on the different speeds of sound through different gases. Another company demonstrated a model of an alarm based on the catalytic oxidation principle. A third company has developed a device for using the power conductors of the trailing cable to send a signal from the machine to the supply source and thus act as a cable- and machine-fault protective device. Use of such devices will provide for greater protection against accumulations of explosive methane-air mixtures than has ever before been achieved.

Feldspar Jigging, by Myron Mellor, McNally-Pittsburg Mfg. Corp., Pittsburg, Kan.

The feldspar jig method of cleaning is an adaptation of the well known Baum principle whereby the coal is subjected to a series of jigging actions while submerged in water, to accomplish stratification vertically according to particle specific gravity. The feldspar fine-coal jig removes refuse in a different manner than the Baum unit, that is, by hutching downward through the screen plate upon which a permanent bed of sized feldspar is retained.

In operation, stratification is accomplished by the Baum jigging principle with a special method of application. The first cell hutch is primary refuse, second and third are refuse and middlings. Third cell hutch, and in some casees second cell, may be recirculated back to the feed to establish a "flywheel" effect in maintaining sufficient bed when reject volume is not extremely high.

Automatic controls eliminate the need for an operator and prevent human error since they permit the box to adjust itself to extreme variations in feed rate and volume of sink in the feed.

Capacity under ordinary conditions is approximately 1 tph per inch of washing compartment width. Ordinarily, top size of feed is limited to approximately ¾ in round.

Froth Flotation at Georgetown Preparation Plant, by Wendel Bearce, preparation engineer, Hanna Coal Co., Cadiz, Ohio.

About 5 yr ago a pilot plant to investigate the beneficiation of solids settled

out of the overflow from the raw-coal drag tank was built at the Georgetown preparation plant. Some 2½ million tons of a mixture of fine coal, clay, pyrite, sand, fine ashes from the drier furnaces and an appreciable quantity of coarser material resulting from spills and overflows had been accumulated in settling ponds since the plant was built. Between 85 and 90% will pass through 100 mesh and 65 to 70% will pass through a 325 mesh screen. The ash varies between 35 and 45%. Operation of the pilot plant indicated that about 60% of this otherwise waste material could be recovered at 10% ash and a nominal cost.

About 18 mo ago a plant was built to produce 10 tph of clean coal and its operation was sufficiently satisfactory that a second and later a third 10-tph section were added.

A dredge pump picks up the settled solids from the pond and delivers them to a storage and agitation tank ahead of the Fagergren flotation cells. The slurry is drawn from the mixing tank by a Morris 8-in pump which discharges into three Heyl & Patterson 14-in cyclones. Each underflow feeds one bank of five flotation cells and each overflow goes to two banks of five cells each.

To handle the coarse material a 6-ft DSM screen was installed between the surge tank and mixing tank. The oversize goes to a ball mill and thence to the mixing tank. Coarse 14x48M tailings are concentrated in a cyclone and then sent to the ball mill before retreatment.

It is the use of the instruments which automatically control mixing-tank level and density that make it possible to operate successfully. One operator runs the plant and handles the dredge to supply the feed. He is on the dredge more than in the plant and must rely on the instruments to control the plant operation.

Horizontal Filtering, by **Mathew Turkovich,** director of preparation, Island Creek Coal Co., Huntington, W. Va.

The horizontal rotary filter is a continuous vacuum filter which rotates in a horizontal plane around a vertical axis. Horizontal filtering of fine coal was first done in 1953 at Rochester & Pittsburgh Coal Co.'s Ernest plant, where a 15-ft diameter unit with 165 sq ft of filtering area was installed. Some time later a 4-ft unit was installed by the Blue Diamond Coal Co. In the early part of 1958 a 19-ft diameter unit with 275 sq ft of filtering area was installed at Island Creek Coal Co.'s Wyoming plant. This is the largest and latest installation of its kind in the coal industry.

The Wyoming plant processes the Sewell seam which is a high grade, medium volatile, domestic, industrial utility and metallurgical coal. It is very friable and has a grindability index of about 101. Run-of-mine coal contains 65% ⅜x0.

Washability studies of the slack showed that a high-grade metallurgical product with 2½% ash and 0.55% sulphur could easily be obtained by conventional cleaning methods. The main difficulty would be handling the coal so there would be a minimum of degradation in cleaning, drying and conveying. As a result, special attention was given to minimizing degradation.

The ⅜x0 is screened out in the old plant and carried by belt to a storage bin in the new fine-coal plant. Coal is cleaned on double-deck tables. Clean coal flows by gravity over a stationary arcuated stainless-steel sieve onto a vibrator. Here the coal is partially dewatered and separated into ⅜x⅛, ⅛x28M and 28Mx0. The ⅜x⅛ goes by belt to a wet clean-coal belt. The ⅛x28M with 27% moisture drops into a small hopper from which it is uniformly spread on the outer 8 ft 3 in of the continuously rotating horizontal filter to a depth of 3 in. After being processed through 6-in cyclones, the 28Mx0 containing 50% moisture is uniformly spread over the previously applied material. This serves as a seal to effect an even vacuum over the entire bed of coal.

When the filter cake reaches the discharge area a 24-in scroll removes the clean coal and discharges it onto the wet clean-coal conveyor. The filter then moves to the clean-out zone where air is blown up through the wire screen surface to loosen any particles embedded in the wire cloth. Additional help is provided by a set of fresh water sprays. Moisture on the filter cake varies from 14 to 16.75%.

The combined mechanically dewatered coals with a combined moisture of about 15% are delivered to two thermal units for final drying to about 3%. Dried slack is carried to the coarse coal plant and loaded separately or mixed with other grades.

Fluo-Solids Drying and Desliming, by **Robert Grimm,** preparation engineer, Inland Steel Co., Wheelwright, Ky.

A full report on fluo-solids drying and desliming, authored by Mr. Grimm, appeared in *Coal Age,* March, 1956, p 104.

Automatic Skip Hoisting at Federal No. 1, by **Stephen Krickovic,** director of engineering and development, Eastern Gas & Fuel Associates, Pittsburgh, Pa.

What started out as a shaft relining job at Federal No. 1 resulted in a complete new shaft installation. Some of the factors that had to be considered in designing the new shaft were as follows:

1. The capacity of the 8-wheel mine cars set the size of the skip and the shaft. New 8 to 10-ton cars were to be added to supplement 650 older cars which were still in good condition.

2. New cars were to be equipped with Willison automatic couplers whereas the older cars had link and pin couplings. To make possible handling of the two types of cars at the dump, two special cars were built. The units are self propelled and have the new-type coupler on one end and the old-type on the other.

3. The old hoist could handle only 560 tph and was taxed to the limit to bring 10,000 tons to the surface in 24 hr. Consequently a new hoist capable of bringing 880 tph to the surface was selected.

4. Dumping capacity had to be greater than hoisting capacity to compensate for normal delays.

The Nolan trip feeder has a special motor and is reversible. The Norberg hoist has Ward-Leonard controls and is powered by General Electric motors. All electric controls are housed in a pressurized room and a ventilation system is provided for the immediate area. Steam also is employed to allay dust around the dump. One man controls the operation by pushbutton from the time the car arrives at the dump until the coal is delivered to the surface bin.

Main Line Haulage With Conveyor Belts, by **William Husk,** chief engineer, West Kentucky Coal Co., Madisonville, Ky.

West Kentucky Coal Co. employs 30- and 36-in panel belts and 42-in main-entry belts. East Diamond and Pleasant View mines use 30-in panel belts. At East Diamond 3,166 acres have been mined, 2,690 with 30-in belt and the balance with 36- and 42-in conveyors. There have been 110 separate installations with an average of 24.5 acres recovered from each setup.

At Pleasant View mine 2,195 acres have been mined, 1,857 acres by 30-in belts and the remainder with 36- and 42-in belts in main entries. There have been 79 installations with an average of 23.5 acres mined from each.

The total cost of 30-in belt operation at East Diamond mine is 8.7¢ per ton of raw coal and at Pleasant View is 8.9¢ per ton of raw coal. Operating costs for 42-in belts at East Diamond and Pleasant View are 4.7¢ and 3.1¢ respectively. Lubrication cost is 0.2¢ per ton of raw coal. Cost of supplying face units at these mines is 6.2¢ per ton.

If we were opening a new mine today in a rectangular or square block of coal with 2 mi maximum haul, we would purchase 36-in panel belts to carry coal around 2,500 ft and 42-in mainline units with drives larger than 200 hp and up to 4,000 ft long. We have found that if we expect an average daily tonnage we must erect a tipple capable of handling 10% additional tonnage and a haulage system capable of 40% additional tonnage. A system capable of handling

1,200 tph would cost about $1,382,619.

Main Line Track Haulage, by **Eugene Ruttle,** production engineer, Mathies Coal Co., Finleyville, Pa.

Modern mining requires high-speed haulage that is safe, efficient, dependable and flexible. Factors which will influence the design of a haulage system include the job it must perform, the property itself and the mining conditions.

Capacity is an important factor in main line service. One argument for the biggest possible car is that it costs relatively less to buy and maintain. A big car also carries more payload.

If one big locomotive can replace two smaller ones there is a savings in labor. Heavy-duty, fast locomotives should be equipped with dynamic and air brakes and have hand brakes for parking.

At present Mathies mine is producing 12,000 tons of clean coal per day in three shifts, using 800 10-ton mine cars and three 50-ton locomotives on the main haulage. A fourth locomotive is kept as a spare. Based on 34% reject, the total raw coal hauled exceeds 18,200 tpd.

Average distance from the face entry sidetrack to the cleaning plant is 9 mi. This will eventually become 18 mi. Trips of 50 to 60 loads are taken to the cleaning plant by one locomotive and one motorman. A 30-ton tandem pusher unit helps these trips over a 2½% grade for a distance of 7,000 ft as a safety precaution but does not follow it to the cleaning plant.

The 44-in main line track is laid with 85-lb rail on 6x8-in by 6-ft creosoted ties spaced 24 in apart. Rail joints are Thermit or electric welded and the ground smooth. Slag ballast is placed under the ties to a depth of 6 in.

Double track enables empties to be hauled on one track and loads on the other. No phones, signal lights or dispatcher are needed.

The initial cost of main line track at Mathies is large but the ton-mile cost for transporting coal is one of the lowest in the industry because little maintenance is needed for track and rolling stock and few men are employed.

Guidebook Coming . . .

The upcoming July issue of *Coal Age* will include both the latest edition of the Mining Guidebook and Buying Directory and the regular features and departments you have come to expect in the monthly issues of *Coal Age*. The July issue is one you will want to keep as a source of reference on up-to-date mining, stripping and preparation practices, and on what is available in supplies and equipment and where to get them. The July issue will be coming to you at the regular time next month. Reserve a place for it in your active file.

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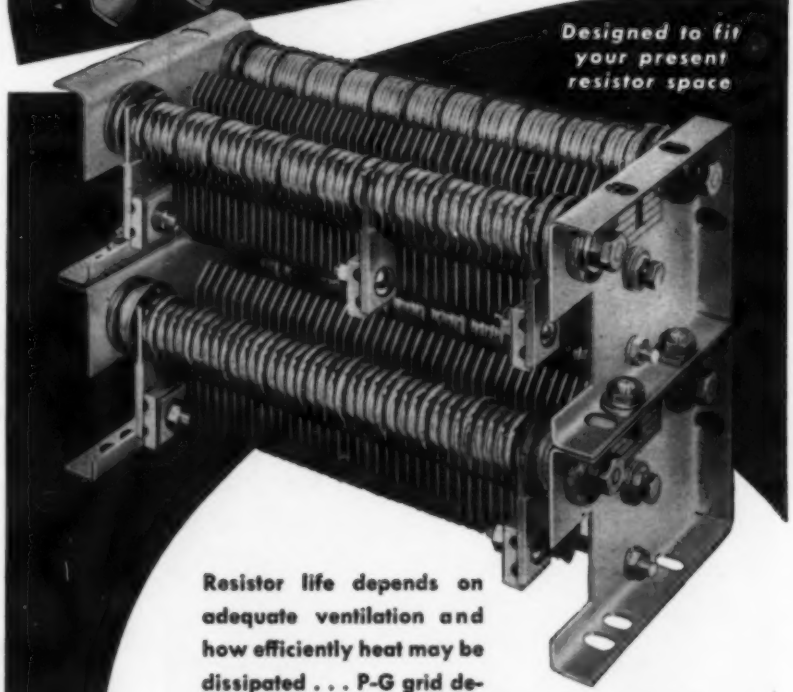

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Chicago Pneumatic has expanded its engineering and manufacturing capabilities by the acquisition of The Reich Bros. Manufacturing Company, Inc., with plants located in TERRE HAUTE, INDIANA and GLASGOW, SCOTLAND.

The acquisition of its new REICHdrill Division affords Chicago Pneumatic an unexcelled diversification in the field of drilling equipment.

REICHdrills, both truck and crawler mounted, are hydraulically-powered rotary blasthole drills. For detailed information concerning REICHdrills, or other CP Drilling Equipment, write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

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BCR HEAD Dr. A. A. Potter (right) presents annual award to J. D. A. Morrow (left), Joy Mfg. Co., while Julian Tobey, Appalachian Coals, Inc., watches.

Is Coal Missing the Research Boat?

Annual BCR meeting voices pride in utilization research program; doubt about industry's capacity to commercialize results; concern over industry's willingness to meet the challenge of modern technology.

A PANORAMIC VIEW of coal research, combining full recognition of results to date with realistic appraisal of the staggering job ahead, keynoted highly-spirited sessions of the 1959 Annual Meeting and Techno-Sales Conference held by Bituminous Coal Research, Inc., April 21-22, in Chicago, Ill.

BCR president A. A. Potter presented the BCR Annual Award to John D. A. Morrow, consultant and director, Joy Mfg. Co. The award honors member company representatives for outstanding leadership in industry-sponsored research.

Technical session chairmen were C. R Mabley, president, Island Creek Coal Sales Co.; E. P. Humphrey, director, Stonega Coke & Coal Co.; and W. A. Barringer, vice president—sales, North American Coal Corp. Following are abstracts of 12 talks and papers presented by technical- and luncheon-session speakers:

The Coal-Pak Solved Our Heating Problem, Sanders A. Frye, business manager, Otterbein College.

When Otterbein decided to put in a new heating plant about 2 yr ago, we were faced with three considerations—selection of a fuel, a site and a heating plant. Selection of the fuel was easy. We had already been using coal and knew that gas would cost 55%, or $7,000 a year more, and oil, $11,000 or 85% more. Site selection was no problem either since we had an ideal hillside location for the plant which would provide gravity coal handling from truck to bunkers to stokers.

Selection of a suitable boiler was more difficult. We were convinced we wanted a water-tube boiler, stoker-fired, that would make little or no smoke. Also the new plant would have to accommodate a connected load of some 16,000,000 Btu and provide for standby and future expansion needs.

Following many discouragements, we heard of BCR's Coal-Pak Automatic which seemed to offer the answer to our needs. After seeing it in operation, we ordered three, which were placed in operation in early 1958. In spite of numerous minor difficulties, we finished the first heating season in good shape, and the past heating season, 1958-1959, has been most satisfactory.

Industry Meeting
A Special Coal Age
Staff-Written Report

The BCR Easy-Flo Bin Device Assures Coal to Larry Cars, W. C. Schott, vice president and general manager, Stonega Coke & Coal Co.

Since the installation of BCR's Easy-Flo Bin Device at our New Pine Branch Colliery coke oven plant, near Dunbar, Va., we have experienced no trouble with coal handling, even during winter operation.

The greatest problem at the coke plant was to push 90 ovens per day with two larry cars in a way which would assure that the slack coal for the ovens could be handled for charging in the allotted time of one oven every 3.6 min.

Since it was necessary that all equipment be designed for this cycle, we turned to BCR. They suggested we test our ¼x0-in slack containing filter cake and 10% moisture in the Easy-Flo device at the Columbus laboratory. The tests proved very satisfactory.

The Easy-Flo device is attached to a 150-ton, 24-ft steel bin with a 60-deg sloping bottom. With a 36-in diameter and a 19-in outlet, the device provides a discharge rate of 8.8 tons per min into the larry cars. Control is provided by a horizontal sliding hydraulic gate automatically operated by a mechanism connected to weigh scales preset by the larry operator.

Why We Are Installing Ten Easy-Flo Units, A. C. Stanojev, head, Mechanical Engineering Dept., Duquesne Light Co.

The first full-scale trial installation of the BCR Easy-Flo bin device at a utility-type power plant will materialize in a new generating section of our Elrama Power Station due for completion next year. The decision to install 10 units was based on these factors:

1. The belief that more uniform coal feed to the pulverizer will result, with no arching, rat-holing or funneling.

2. The hope that the Easy-Flo units will allow greater utilization of the stored bunker coal which in turn will reduce the time of coaling periods, allow longer maintenance periods for the coal handling systems, and make it possible to skip weekend coaling operations.

3. The hope that greater utilization of volume will cut down the number of inactive piles of coal and thereby reduce the hazard of fire and explosion.

The Easy-Flo bin is also attractive since it is a static device requiring no auxiliary assistance.

BCR Stack Sprays Have Reduced Dust Emission, Joseph Mullan, district manager, Bituminous Coal Institute.

As a result of BCR research, it is now possible to control stack emmision during soot blowing.

The BCR Stack Spray, developed 2 yr ago, is a simple waterspray nozzle mounted in the stack to give complete coverage of the cross section of the stack. The spray is turned on during soot blowing and knocks down most of the solid particles entrained in the flue gases as they enter the spray zone of the stack; thus, the particles are deposited at the base of the stack instead of over the neighborhood.

BCR has taken all the guesswork out of spray installations through its bulletin, BCR Aid-to-Industry 500-330, which explains the location of the spray, correct nozzle size and pipe diameter, proper water pressure and other details. Installation materials cost from $35 to $100 but the results obtained make the cost insignificant.

Now the end result of this research—satisfied coal consumers and good plant public relations—can be appreciated; and as an economic bonus, this effective device costs far less than its ineffective predecessors in the soot reduction field.

BCR General Research Program, James R. Garvey, director of research, R. A. Glenn, supervising chemist, R. J. Grace, project engineer, J. W. Tieman, supervising engineer, Bituminous Research, Inc.

Beginning July 1, 1958, the electric utility and coal industries started a 2-yr cooperative research program on air pollution control at BCR's Pittsburgh laboratory. One project consists of engineering evaluation and exploratory research on methods for control of contaminants in flue gases; the other, research and development on methods for decreasing sulphur in coals. Both projects are progressing satisfactorily.

For the past 2 yr, studies have been conducted on the plasticity of bituminous coals as they affect the design of combustion equipment. Benefits so far not only include a broadening of knowledge on factors affecting the combustion of coal, but also the development of new and standard test methods. Future programming includes (1) the development of a quantitative procedure for the rapid determination of the degree of oxidation of bituminous coal, (2) a study of the kinetics of reactions involved in the formation of plastic coal, and (3) a study of the effects of oxidation on commercial coal sizes.

A device for the continuous measurement and recording of moisture in coal as it passes over a conveyor is now in the field testing stage. Initial successes indicate the device may be made available to the industry sometime later this year.

The Hercules Powder Co. is sponsoring development of a new type of mining machine designed to combine loading, cutting and shooting of coal into one mining operation. Tests conducted both above and underground show (1) the basic approach is feasible, and (2) further study is justified.

Also promising is development of a rubber belt conveyor which provides automatic extensibility through belting that is automatically folded and stored. Construction of a full-scale unit is now underway. Plans call for demonstrating feasibility of the idea to equipment manufacturers this summer.

The full-size-4,200 hp gas turbine installation developed by the LDC staff at Dunkirk, N. Y., has been loaned to USBM and is now being erected at Morgantown, W. Va. USBM's objective is to establish the feasibility of the coal burning gas turbine for power generation in stationary plants.

BCR is conducting an increasing amount of cooperative research. Notable are the cooperative programs on air pollution control with electric utilities and The Commonwealth of Pennsylvania, and on mining equipment with Hercules Powder. Just recently, too, the Atomic Energy Commission has proposed an agreement to study the potential application of radioisotopes to the mining, transportation, storage and use of coal.

Field testing continues on BCR-developed equipment, including the Coal-Pak, Coal-O-Matic, Fire Jet Stoker and Easy-Flo Bin Device. In connection with all, technical problems of major concern have been overcome.

Problems Confronting An Industry Research Organization, Dr. R. L. Savage, vice president—research, North American Coal Corp.

Two major problems existing in an industry research program are (1) selecting projects and (2) selling the program to sponsors.

In the selection of projects an industry research association should require that participating firms be able to exploit the anticipated results. Several successful research projects undertaken by coal industry research may never attain full commercial realization because there is no effective mechanism in the coal industry to commercialize the results.

The functions of an industry-supported program should be to solve technical problems which are common to the industry and to generate new ideas. Both of these may then be used by individual companies for their own profits.

Solving industry problems might include, for example, (1) improved transportability of coal by pipeline (hydraulic or pneumatic), liquefaction, gasification, and high voltage transmission; and (2) detecting and preventing rock bursts or squeezes in mining operations.

Basic research aimed at generating new ideas is essential to applied research and product development. The great opportunities now lie in discovering new

Guiding BCR Destinies

Five new members elected to the 15-man BCR board are Eugene Gordon, vice president—power, West Penn Power Co.; S. B. Johnson Jr., president, The Lorado Coal Mining Co.; S. T. Saunders, president, Norfolk and Western Ry. Co.; R. P. Tibolt, executive vice president, Eastern Gas and Fuel Associates; and W. W. Wearly, president, Joy Mfg. Co.

The election of Mr. Gordon and Mr. Wearly gave board representation for the first time to the electric utility and equipment manufacturing industries.

Three board members reelected are A. A. Potter, president, Bituminous Coal Research, Inc.; R. L. Savage, vice president—research, North American Coal Corp.; and L. N. Thomas, president, The Carbon Fuel Co.

The remaining members of the board are: R. E. Dean, assistant to the president, Ayrshire Collieries Corp.; R. H. Hughes, president, Clinchfield Coal Co.; E. P. Humphrey, director, Stonega Coke and Coal Co.; C. R. Mabley Jr., president, Island Creek Coal Sales Co.; Jos. Pursglove Jr., vice president—research and development, Consolidation Coal Co.; C. F. Spencer, administrative assistant, Pittsburg & Midway Coal Mining Co.; and W. S. Webster, vice president and general manager, Walter Bledsoe and Co.

Among BCR officers, Joseph Pursglove, Consolidation Coal Co., is newly elected first vice president. Reelected are A. A. Potter, president; H. J. Rose, vice president and consultant; J. W. Igoe, secretary and treasurer and director of Administration; and D. P. McCloskey, assistant secretary and assistant treasurer.

materials and new properties in existing materials.

The successful culmination of scientific work demands at least three things: (1) capital to implement research results; (2) proper management to plan, build and operate the new venture, and (3) continuing research and technical service to follow the new development. These are the real needs which should be considered carefully in advance if full realization of the research investment is to be made.

What the Large Industrial User Will Expect from the Coal Industry, Howard Baldwin, director, power section, manufacturing staff, General Motors Corp.

When asked what they expected of the coal industry, six large divisions of General Motors, who burn more than a million tons of coal per year, reported that the source of coal must be dependable and the product consistent as to sizing, ash, sulfur, and burning characteristics.

In the design and selection of equipment, there should be early discussion of better equipment at a management level as well as the operating level. When all factors of cost are brought into clear focus, the lowest cost steam is often produced with something better than the boiler and firing equipment costing the least.

In the operation of modern industrial power plants, good instrumentation and combustion control are necessary in order to know every moment how the equipment is operating in relation to its capabilities.

By and large the bituminous coal industry has done, and is doing, a most outstanding job. Especially notable is the fact that the cost of better coal has not increased proportionately to other commodities in the post-war years.

Research in the Coal Industry's Future, Dr. J. T. Rettaliata, president, Illinois Institute of Technology.

Research offers the best assurance for success if coal is to capitalize on its enormous future market potential.

Although research is often expensive, dynamic projects of industry-wide significance can be undertaken on a cooperative basis, through agencies such as BCR, on terms which permit the smaller units in the industry to participate in the programs.

A successful research program should aim at a broad attack on all facets of the industry's operations—mining, preparation, transportation and utilization—through a long-range, coordinated, intensive research program. This program should be based upon active, long-term basic research.

And if it is well-planned, adequately supported, and properly balanced as to basic and applied, the program could be expected to develop the necessary new technology to maintain and improve the competitive position of the coal industry.

Some of the challenges which the coal industry research races include: advancement of mining technology so that when less-easily mined coal is needed it can be made available at, or near, present prices; improvement of direct combustion of coal; low-cost gasification of coal; expansion of electric heating from the residential into the commercial and industrial markets; continued research on chemical uses of coal; and basic research on the effect of radiation on coal and its products.

Factors to Consider Before A Manufacturer Will Build New Coal-Burning Equipment, L. C. Dubs, president, Canton Stoker Corp.

Because only 1 in 20 business ventures will prove successful, a manufacturer should consider the following 15 factors before building new coal-burning equipment: price range; potential volume; method of marketing; cost of developing, engineering, producing and marketing the product; how the product will fit into engineering, production, and sales; what additional advertising will be needed; the nature of competition; adequate plant capacity; sufficient and experienced plant personnel; effect on present products; need for additional capital and financing; capable and sufficient executive and junior executive talent; and profit needed to justify the venture.

By way of encouragement, however, the odds are much more favorable for those who are currently running a successful business.

Never to be underestimated in any case are these intangible factors which spell SUCCESS: S—spirit, U—unity, C—courage, C—capacity, E—energy, S—service, S—stability.

BCI Opens Doors for Equipment Sales, R. L. Ireland, chairman, executive committee, Consolidation Coal Co.

BCI is doing much to help build sales through personal contact and public relations, but much more help is needed from the industry.

For many plants there should be a more immediate source of help than BCI. In any coal-burning plant there is a point of contact with one or more coal salesmen. At the first trouble signal of any operational difficulty, the supplying coal company's own engineering staff should be alerted.

With its present limited staff, BCI can handle only a few such calls for help, but if it is given the history of "problem plants" in time, it can get an engineering foot in the door that will keep the plants from turning to other fuels.

Coal salesmen who keep in touch with what is going on in the plants they sell and keep an eye on probable new construction, can continue to furnish valuable leads to BCI and also create a more favorable impression for coal.

The Formation of a Coal-Burning Equipment Company & How It Is Marketing Coal-Burning Equipment, Martin Burke Jr., President, North Western-Hanna Fuel Co.

The Coal Burning Equipment Co. was organized on July 1, 1957, by all the Lake Superior dock companies to take over and expand activities of the Heating Div., Carnegie Dock & Fuel Co.

The function of the new company is to sell coal burning equipment in the area served by the Upper Lake Docks: Upper Michigan, Wisconsin, Minnesota, N. and S. Dakota and part of Iowa.

Company objectives are:

1. To upgrade coal burning equipment in order to increase the efficiency of the consumer's plant; to reduce his labor costs and enhance his satisfaction with the use of coal.

2. To gain new accounts for coal by the sale of coal-burning equipment to consumers now using a competitive fuel.

3. To gain new accounts for coal by aggressive, promotional activity to sell new installations.

This company should soon be financially self supporting. Perhaps more important, its success suggests that similar programs could readily be projected to other coal marketing areas if the industry would establish a national program to encourage same.

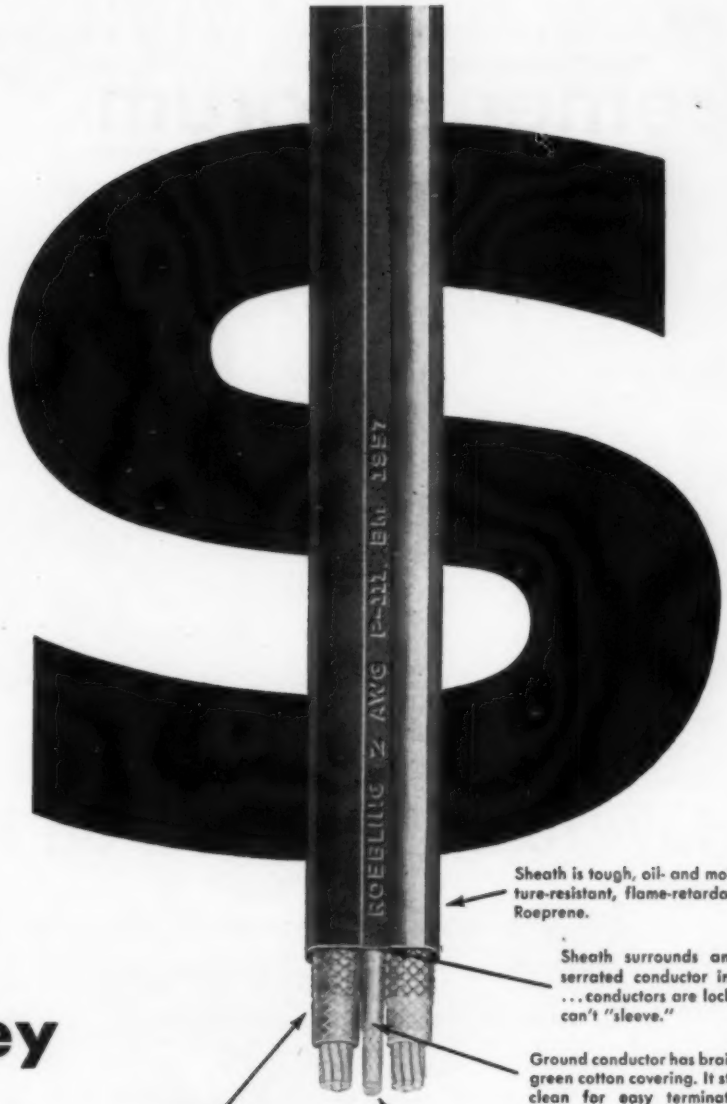
Market Planning for New Equipment, W. W. Bayfield, executive vice president, American Coal Sales Assoc.

The coal industry should create in each major coal-consuming state and elsewhere, by regions, a coal equipment sales and service company. Such companies are much needed to provide better service to retailers and consumers in the 50-million ton off-track market (small industrial plants, schools, apartments, greenhouses, etc.).

Original investments should be made on a pro-rata basis by those who are currently shipping coal into these territories for this market. These organizations should not be tied to any particular manufacturer, but should be ready and able to sell any and all brands of equipment, fitting the equipment to the job.

We must make it easy, very easy, for people to buy, install, and have serviced coal-burning equipment. If we don't, all our promotional efforts, all our public relations activities, just like all our research, become a meaningless waste of money.

For the **extra life** that's **money in your pocket...**


ROEBLING 2 AWG 12-111 BM 1957
Sheath is tough, oil- and moisture-resistant, flame-retardant Roeprene.
Sheath surrounds and grips serrated conductor insulation ...conductors are locked fast, can't "sleeve."
Ground conductor has braided green cotton covering. It strips clean for easy terminating, splicing.
GR-S insulation around each power conductor is heat- and moisture-resistant.
Ground conductor is braided and eased into shape from fine annealed copper wire for outstanding resistance to flexing fatigue and tensile stress.

ROEBLING PARALLEL TWIN CABLE!

This economical, extra-flexible cable is available as Type G, with ground wire, or Type W, without. Complies with the flame resistance test of the State of Pennsylvania, Department of Mines, and the requirements of the U. S. Bureau of Mines, and carries the marking P-111BM.

A combination of quality features makes Roeprene® Parallel Twin Mining Machine Cable different and better. Some of these features may seem like small details . . . but, taken together, they figure *big* in terms of easier installation and maintenance, and valuable *extra* service life. Flexible Roeprene Parallel Twin Cable is built to take tough treatment!

For more details about these cables, and the savings they mean, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
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Foremen's Forum

A Foremen's Forum Book Review:

How to Tell What You Know

Simple words, a single idea in any speech situation, intelligent use of praise . . . these are important fundamentals in achieving effective communications.

IN HIS BOOK entitled "How to Tell What You Know," the author, Arthur Secord, talks directly to foremen on one of the most important aspects of supervision, the effective transfer of an idea from a speaker to a listener. In fact, supervision consists almost entirely of interpreting the requirements of a job and communicating those requirements to the people who are to do the work.

Dr. Secord sets the stage in his preface to the book. He says, ". . . the foreman needs these techniques of communication more than most men because of the unscientific procedure by which he is frequently selected. In many instances he is not made a foreman because he has successfully completed a course in foremanship training. (In some instances he is not even given such a course after his selection.) Is he made a foreman because someone recognizes in him a natural leader of men? Is he made a foreman because he seems to possess the attributes of an effective teacher? No! He is made a foreman because a foreman is needed and he appears to be the best available material. . . . He is made a foreman because of some part of his knowledge or ability—because there is something that he does well. Once he becomes a foreman, he is no longer asked to do the job. His knowledge is now useless to him until he transfers it to someone else. But he wasn't made a foreman because he could transfer knowledge. He was made a foreman because he had the knowledge."

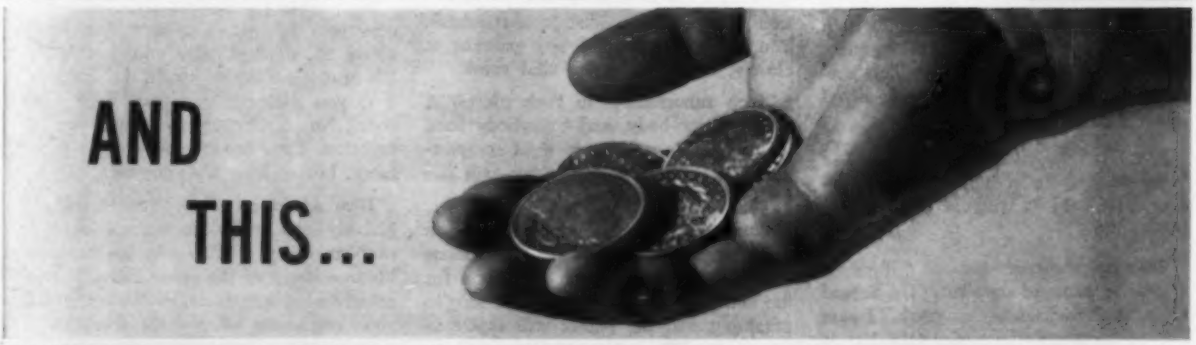
Taking it from there, Dr. Secord explains and illustrates some tested techniques for successfully getting across to others your ideas and suggestions. Among his major points are these:

Either you speak the other fellow's

About the author of the book:

DR. ARTHUR SECORD, director of community service and professor of speech, Brooklyn College, Brooklyn, N. Y., is a well-known lecturer in coal-mining circles. He was featured speaker at the 1958 meeting of the Illinois Mining Institute and at the recent Spring meeting of the Indiana Coal Mining Institute. He will be remembered by many others as the deliverer of the "Early Bird" lectures at the National Safety Congress at Chicago in 1952 and again in 1955. His book, "How to Tell What You Know," is based upon the ideas in his absorbing talks before the mining groups in Illinois and Indiana. It was published recently by The American Press, 489 Fifth Ave., New York 17, N. Y. The clothbound book is 72 pp in length and its price is $2.50 per copy.

WEMCO-FAGERGREN FOR FINE COAL FLOTATION



WEMCO®

a division of
Western Machinery Company, *Dept. C. A.*
650 Fifth St., San Francisco, Calif.
and throughout the world

Coal operators now have a solution to washery water reclamation and stream pollution problems, producing, at the same time, a marketable fine coal product! Wemco-Fagergren Flotation Machines are at work in a number of installations, proved in low-cost, efficient recovery of clean coal fines, removal of solids from cleaning plant water and clarification of water for re-use in closed plant systems.

If you have a coal recovery problem, chances are that Fags can turn it to advantage. Ask for complete information now!

language or communication does not take place. It is the speaker's fault if a listener does not understand. A man learns by building on what he already knows. Therefore, you must word your message in such a way that it will fall within his past experience. The procedure by which you tell a man something that does not fall within his experience is to tell him the manner in which it is similar to or different from something that is within his experience.

Three of the most common mistakes made by supervisors are (1) the use of unfamiliar words, (2) the fear of speaking simply and (3) the use of too many words. The author illustrates the first point by telling of the plumber who poured hydrochloric acid into a clogged metal pipe. He later discovered that the pipe had disappeared. He wrote to a chemical laboratory, seeking their advice in the matter, and he received this reply:

"Dear Sir:

The efficacy of hydrochloric acid is indisputable, but the corrosive residue is incompatible with metallic permanence."

The plumber wrote again to tell the chemists he was happy they approved of what he was doing but that he still would like to know what happened to the pipe. A practical chemist took over the correspondence, and the plumber received this reply:

"Dear Sir:

In cleaning metal pipe, don't use hydrochloric acid—it will eat the hell out of the pipe."

This is communicating.

On the virtue of simplicity, Dr. Secord refers to Patrick Henry's remark, "I care not what course others may take but as for me, give me liberty or give me death." This is a powerful, direct expression, a fine thought in simple words.

Another principle is this: In any speech situation, never try to make more than one point. There was a foreman who wished to correct one of his workmen on a minor point. He thought he would save time if he waited until he had more things to tell him. At last he had eight different things to discuss with the fellow, so he approached him and cut loose with all eight points.

If the workman remembered anything, it was probably the first point or the last one. There is no room for more than one point in a speech situation. Chances are this foreman has seven more trips to make to the worker.

Always use an example in teaching. (One of the virtues of this little book is that the author practices what he preaches. His points are clarified by examples.) Dr. Secord's example of using examples in teaching tells of a workman who was operating a band saw with the protective guard standing open. His foreman approached, held up a hand on which there were three stumps where there had been fingers, and said, "Tim, if I were you, I'd close the guard on that saw." This was a lesson the operator might never forget.

The intelligent use of praise is a vital lubricant in effective communications. Dr. Secord observes that some people oppose the idea of praising a man for doing the things he should do. But he points out that one of the forces for good in this world is the hope of heaven in the hearts of men, and in a job situation sincere praise is a little bit of heaven to the receiver of that praise. If a man builds a good safety record, he should be praised or publicly recognized—even though he is only doing what he should do.

On the other hand, never use praise as a prelude to criticism. If circumstances make it necessary for you to criticize a man's work, do so, with tact and directness. But don't begin the criticism with a word of praise or you may find yourself in the position of the foreman who said, "Fred, you're the best turret lathe operator in the shop."

Fred replied, "I know that. What's wrong?"

These two men may find it difficult to communicate openly from now on. They will parry and thrust.

10 Ways to Petrify Progress

By Al Hormel and Lydia Strong

Shoot first—ask questions later. Catch new ideas when they're in the vulnerable embryonic stage. A swift, snappy objection will bring the idea to a standstill. You can then pick it up, examine it closely, and remove the vital spark.

Keep subordinates in their places. A job for everybody, and everybody hard at his job. Keep them in tight compartments and their ideas—if any—will die for lack of air.

Point out the microscopic flaws. So the new patent package for persimmons could earn an additional $5 million for the company? Maybe so—but be sure to point out that the patent will expire in 17 years. Then too, the persimmon trees may become diseased, or the persimmon producers may demand a larger share of the profits. If you can conjure up enough difficulties, the project may well be postponed.

Set standards impossibly high. A plan to cut office costs 3%? Too piffling even for discussion. The only plan you will entertain is one that will cut all costs at least 30%, hike prices and insure increasing dividends for the next 25 years.

Follow accepted practices. Has the proposed approach ever been tried before in your industry? If not, it can't be much good. Better stick to the tried-and-true: follow the lead of your industrial confreres (even if they're heading straight for oblivion).

Make all the decisions—nobody else knows how. You may, however, put your subordinates through the motions of a democratic discussion. After a few practice sessions they will get the point, and you may then rely on them not to voice a single unwanted or unexpected idea.

Keep your job to yourself. Don't discuss your job; don't tolerate questions; above all, don't divulge your problems. It's true that others might be able to help you, but can you trust their motives? No, far better to struggle on in isolation. Your tower may not be pure ivory, but at least it's your own.

Hire an expert to do your thinking. Nobody can really be trusted with a problem except a man who has made a lifetime study of the subject and knows exactly what not to do. And what could your employees offer—aside from common sense, insight and experience in your business? Another advantage of having one man do all your thinking is that you can easily fire him if he starts getting too original.

Permit no criticism. It's bald faced treachery to question so much as a single routine established by the Founders—who have long since gone to their reward. (If they were still around, they'd be making changes—but that, of course, is a different matter.)

Snatch all the credit. Despite your severest squelching, some insensitive persons may continue to come up with new ideas. In these extreme cases, your best policy is to accept the ideas, but proclaim them as your own. The chances are you won't be bothered again—at least, not by the same individual.

Reprinted from *Management Review*, a publication of American Management Association, Inc.

It's PRESTRESSED!

Quaker Thermoid Conveyor Belting keeps rolling with the punches

Before it ever comes to you, the heaviest tension you'll put on Thermoid-Quaker Conveyor Belting has already been built in—and then released *after* curing. So the rubber and fabric are really in *compression* when you put the belting to work—ready for the toughest pull without overstraining the yarn or the cover.

There's a Thermoid-Quaker belting designed with just the combination of properties you need for each conveying job. To get the right belting for *your* needs, talk with the Thermoid industrial distributor nearest you, or write to *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

Notice how the special "Coledge" construction of Thermoid-Quaker Belting provides greater flexibility at the edges—more shock-absorbing rubber where the worst beating occurs.

THERMOID DIVISION PORTER **H.K.PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

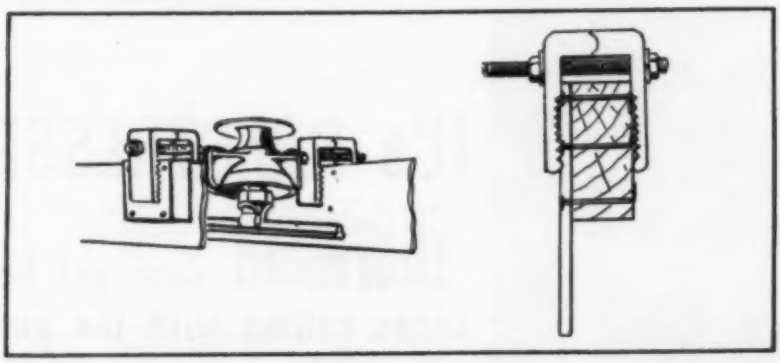
Operating Ideas

Time Clock Checks Battery Charging

A TIME CLOCK about to be scrapped by The Martin Co. is now keeping accurate check on industrial truck-battery charging, eliminating extra, time-consuming paper work, according to *Exide Topics*.

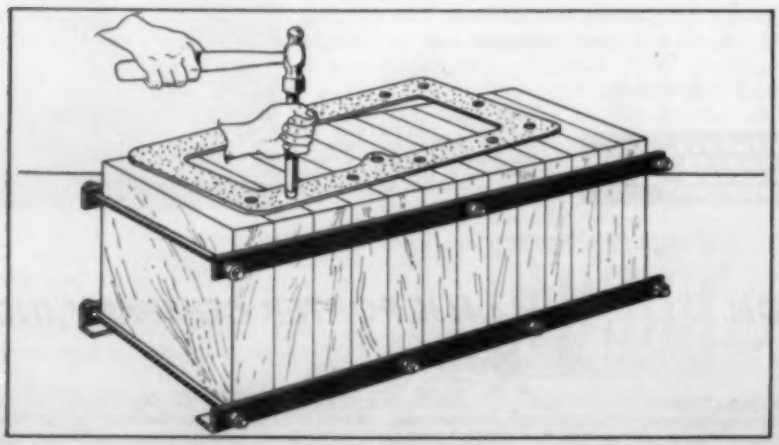
When a battery is brought in to be charged, a card is identified with the battery, then is "punched in" at the time clock. The specific gravity of a pilot cell is recorded on the card along with the time and date. Following charge the card is "punched out" and the gravity is again recorded. This method assures that each battery receives its proper charge.

Old Belt Makes Better Wire Guard



DISCARDED fire-resistant belt is salvaged and used for making better trolley-wire guards at Eastern Gas & Fuel Associates' Keystone mine, according to *The Safe Mine Foreman*. The discarded belt is put through a band saw and cut into strips 8 in wide and any desired length. Keystone officials say that belt strips are superior to wooden guards which break and splinter, and to plastic material which curls when contacted by grease. Furthermore, wood and plastic must be bought and the belt is scrap.

Keystone management says that wooden spacers must be nailed to the belt because the regular guard-board clamps are too wide to clamp the belt alone.



Gasket Block Extends Punch Life

HOLE PUNCHES last much longer and work much better when used on an end-grain block, writes C. H. Willey, Penacook, N. H. He says that a good gasket block can be made by cutting equal lengths of hardwood boards, stacking them together with the grain ends up and then binding them together. Angle irons provide a base and hold the boards together at one end and two steel straps hold them together at the other end. The straps and angles irons are joined by bolts which are tightened as much as necessary to hold the blocks together.

Du Pont Announces Major Improvements in Safety of Permissible Blasting

Du Pont High Salt Permissibles

On the basis of investigations conducted by the U. S. Bureau of Mines, all Du Pont permissible dynamites now contain 10% of salt. This flame-cooling agent significantly reduces the chance of a gas or dust explosion due to misuse of the explosive.

Permissible explosives in the United States have a marvelous safety record. The Bureau of Mines states that no permissible, when used in a permissible manner, has ever caused a coal mine disaster. Some gas and dust ignitions have occurred, however, when human failure resulted in non-permissible conditions of use.

Du Pont's adoption of 10% salt in its permissible dynamites substantially reduces the risks involved in human failure. Our interpretation of the Bureau of Mines data indicates a reduction of about 50% in the tendency to ignite coal gas.

The inclusion of salt has no effect on the strength, sensitiveness, or any other explosive property of Du Pont permissibles.

This has been established conclusively in a year of extensive field use throughout the country.

Permissible Multiple Firing with Du Pont MS Delays

Many hard rock mining and quarrying operations have increased safety and economy by using multiple firing with short-interval delay electric blasting caps. Permissible, short-interval delay blasting with Du Pont MS Delay Electric Blasting Caps can bring these same advantages to coal shooting.

Increased Safety. Short-interval delay blasting reduces exposure to dust, fumes, smoke and coal falls, since it is unnecessary to re-enter the room until all shooting is completed. It is easier on roof and ribs, so it reduces the hazard of roof and coal falls.

Increased Economy. Permissible multiple firing will cut production costs as well as increase safety. Reduced shooting time produces more coal per man-hour. Improved displacement gives better loadability. And this more efficient blasting gives a lower powder factor.

New Permissible Blasting Machine

A new Du Pont 20-shot permissible blasting machine has been designed specifically for short-interval delay blasting in coal mines. It is authorized by the U. S. Bureau of Mines for firing up to twenty 16-foot, iron wire MS Delay Electric Blasting Caps.

More information

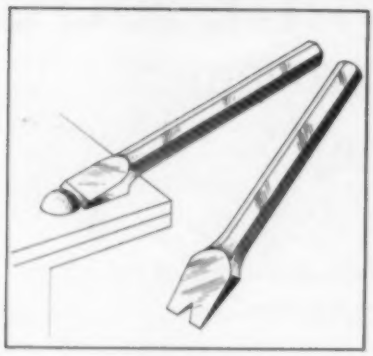
For complete information on how Du Pont's new high-salt permissibles, MS delays, and permissible blasting machine can increase the safety of your operations, call your Du Pont representative or write directly to Du Pont, Explosives Department, Wilmington 98, Del.

DU PONT EXPLOSIVES

REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

Operating Ideas (Continued)



Special Chisels Cut Rivets Easier

HERE are two special chisels used by C. H. Willey, Penacook, N. H., to simplify the job of cutting the heads off rivets. One chisel has a straight cutting edge and is shaped so that the cutting edge will not cut into the members riveted together. The second chisel has a V-shaped cutting edge that fits around the rivet head and has less tendency to slide when struck by a hammer.

Mr. Willey also suggests that a piece of old innertube be cut and placed over the end of any chisel to protect the hand of the worker from chips or a glancing blow of the hammer. He recommends that a backup block or a dolly be used against the rivet if possible.

To keep flying chips to a minimum, Mr. Willey says that "mushroomed" heads on chisels should be reshaped frequently with a suitable power-driven grinder.

Maintenance Tips For Hot Weather

HOT WEATHER is here again and with it comes a change in maintenance problems for bulldozers, scrapers, trucks and other engine-powered equipment. To assure satisfactory and economical performance from these important units a few simple precautions should be observed. The following suggestions, published in the Allis-Chalmers *Reporter*, may prove useful in preventing downtime, expense and inconvenience at your operation.

Check Lubricants

1. Refer to the operators manual for the proper grade and quality of lubricant specified for hot weather. Stick to these specifications for best results.

2. Maintain the proper level in crankcase, transmission, final drive etc. Too low or too high lubricant levels cause overheating and may impair performance.

Service Lubrication System

1. Flush the engine lubrication system occasionally and replace the filter elements with factory-approved elements as recommended to maintain unrestricted flow of clean oil.

2. Keep the engine-oil heat exchanger clean so the oil can cool properly. Foreign matter on the exchanger reduces the effectiveness of the heat-transfer area.

Inspect the Cooling System

1. Keep the cooling system filled with clean soft water. Check the water level before the start of each day's operation. Rust inhibitor will prevent the formation of rust, scale and sludge and will thus extend the life of the radiator and cooling system.

2. Check coolant circulation in the radiator. Poor circulation results in overheating which may damage the engine.

3. Keep radiator passages free of leaves, dust and the like which will restrict the flow of air. Good air circulation is vital to keeping engines cool.

4. Check the condition of radiator hoses and replace them if in poor, deteriorated condition.

5. Check the fan belt tightness. An excessively loose belt causes overheating.

6. Check air baffles for proper positioning to prevent recirculation of air.

7. Check thermostats for proper functioning. A faulty thermostat is likely to result in engine overheating.

Watch Tires

1. Check for proper inflation before the start of the day's operation. Under inflation results in excessive heat and possible damage to the sidewalls. Over inflation results in poor traction, rapid tread wear and possible rupture of the casing. Tires should not be bled when hot.

2. Inspect tire casings frequently and repair cuts or breaks as soon as possible to prevent further damage.

3. Repair cuts in the treads to prevent peeling of the tread from the casing.

Car Stop Has Tie Catcher

ONE of the most common safety devices used in a coal mine is the car stop. John Biela of Hanna's Ireland mine shows a car stop he designed and which has several noteworthy advantages. For example, the stop not only rests firmly on the rail but also has a tie catcher that prevents it from being pushed along the rail after it is positioned. It also has two oblong holes in it that make it easy to handle.

Special Fasteners

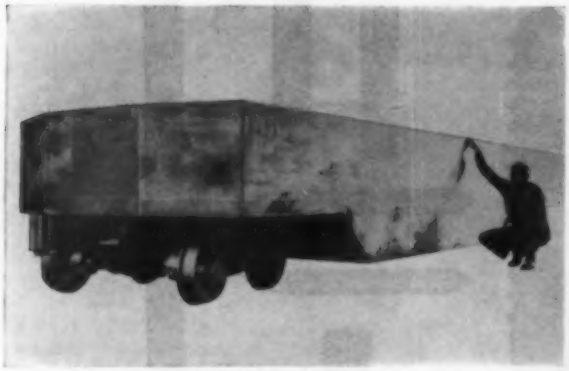
Bethlehem makes the widest variety. Those you see here are just a small sample of the steel specialties we can produce. And our fasteners engineers will help you design products, whether they are headed, threaded, slotted or pointed. Try us. Our Lebanon, Pa., plant is geared to turn out your order fast.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Equipment Developments



Aluminum Mine Car

All-welded aluminum mine cars with 15-ton capacities have been manufactured by the Watt Car & Wheel Co., Barnesville, Ohio, for use in a mine in the Wheeling, W. Va., area. The cars are operating along with steel cars of the same size. The same construction was used in the aluminum cars as in the all-welded steel design and the Sigma method of welding was employed. Made with Type 6061 aluminum, the cars are 26 ft long inside, 7 ft wide and 4 ft high. They weigh 35% less than the steel cars with which they are operating.

Mounted Drill

A self-propelled rotary drill that mounts on tracks or dual pneumatic tires, making it adaptable to mine, quarry, utility and construction work, is a new product from Drilling Accessory & Mfg. Co., Inc., Dallas, Tex. Only one operator is needed because all controls are in one position. The "Blastholer," states the manufacturer, drills 2 to 5 times faster than comparable equipment and carries its own air for cleaning blast holes. Dimensions of the standard 20-in machine are as follows: frame length, 15 ft; width, 8 ft; mast projecting front, 15 ft, 10 in; overall height on the road, 8 ft; and overall height with mast raised, 31 ft. The drill bites holes from 2 1/4 to 3 7/8 in with variable rotary speeds from 25 to 325 rpm and constant controlled down pressure.

Washing-Table Covers

You can now order replacement rubber covers with rubber riffles factory attached for its Diagonal Deck washing tables, reports The Deister Concentrator Co., Inc., Fort Wayne, Ind. New Concenco all-rubber riffle covers are supplied with the appropriate riffling system, the riffles being cemented to the covers except that in all cases the tailing riffle is provided separately for on-the-job assembly. The cover is trimmed and fitted at the factory for easy replacement in the field, resulting in substantial time savings according to the manufacturer.

New Motor Grader

More visibility, easy moldboard tilt adjustment, enclosed ball-socket lift link caps and a new 6-cylinder engine for 3 models are some of the features LeTourneau-Westinghouse Co., Peoria, Ill., cites for its new motor graders. Besides these is the main new benefit, greater circle size which, reports the firm, provides more blade stability. The circle,

Sizing and scalping are a snap with

HENDRICK FLANGED LIP SCREENS

Use the Hendrick Short Slot Lip Screen for exact sizing. Use the Medium or Long Slot Lip Screen in gravity screens for scalping, removing fines, or discharging loading chutes.

All provide better separation . . . practically eliminate costly delays caused by blinding.

Hendrick Flanged Lip Screens are available in openings from .010 x .025 x ½ (equivalent to 1/32" Round) to 10½ x 11½ x 13 (equivalent to 16" Round). Write to Hendrick today for information on the kind of Flanged Lip Screen that will fit your requirements best.

HENDRICK MANUFACTURING COMPANY

41 DUNDAFF STREET, CARBONDALE, PA.

PERFORATED METAL • PERFORATED METAL SCREENS • WEDGE-SLOT SCREENS • HENDRICK WEDGE WIRE SCREENS • ARCHITECTURAL GRILLES • MITCO OPEN STEEL FLOORING – SHUR-SITE TREADS • ARMORGRIDS • HYDRO DEHAZERS • DISTILLATION COLUMN INTERNALS

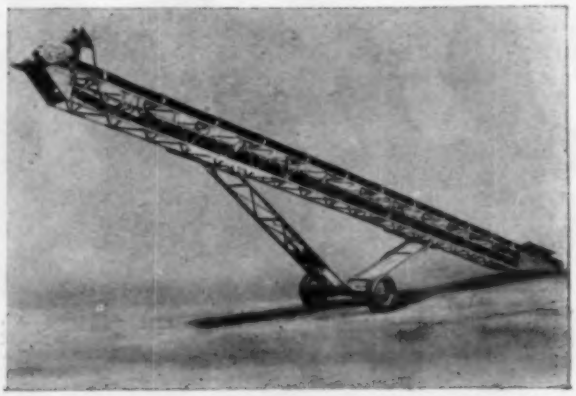
63 in as compared to 54 previously, permits the operator to do a more efficient job of finish grading. Circles on the grader have replaceable teeth. All engines are rubber-mounted to minimize vibrations.

Portable Screening Plant

Model PS-70 portable screening plant from Barber-Greene, Aurora, Ill., gives highest capacities and unmatched portability at lowest cost, according to the firm. Because the plant screens while it loads, it permits the two operations to be done simultaneously, saving time and expense.

The entire system is ruggedly built for long life under adverse conditions, states Barber-Greene. It consists of a vibrating screen, portable belt conveyor, reciprocating feeder and hopper or trap for feeding and comes in sizes to suit every screening requirement.

Towable from job to job, the plant is driven by a gasoline engine with V-belts to the first and second countershafts and a chain drive to the conveyor headshaft. The entire operation is controlled by a head-pulley clutch located at the head end of the conveyor.



Portable Conveyors

For stockpiling, truck loading, feeding crushers and other similar applications new heavy-duty portable conveyors from Barber-Greene are available. Three new units in belt widths of 18, 24, 30 and 36 in with lengths from 33 to 60 ft in 3-ft increments have been added to the company's line.

Model PA-70 has a torque-arm drive powered by an electric motor mounted overhead at the head end of the conveyor, making long V-belts, chains or lineshafting unnecessary.

Model PB-70 has a V-belt and countershaft drive powered by a gasoline engine. It is said to offer real economy and maximum simplicity for maintenance and repair.

Model PC-70 has a lineshaft drive run by a gasoline engine. Highly efficient and economical to maintain, according to the firm, the conveyor's power is transmitted by short V-belts from the engine to a reducer inside the conveyor truss.

Fire-Fighting Fluid

Fire-resistant hydraulic fluid for all types of hydraulically-operated mining machinery, now available from Shell Oil Co., New York 20, is considered to be a major advance in mine safety. New 3XF(R) mine fluid is a water-in-oil emulsion-type liquid with built in fire extinguishing qualities which reportedly smother hydraulic-oil fires before they can blaze up. Shell Oil had the cooperation of the Bureau of Mines in developing the fluid. First tested extensively Jan. 14, 1959, in an open flame, high voltage arcs or hot metal, the water content is released as a steam blanket to quench combustion. a Fairmont, W. Va., coal mine, it is supplied as an oil concentrate that is easily mixed with water right on the job. The resultant mixture, an opaque white emulsion-type fluid is made up of tiny droplets of water, each one surrounded by a tough lubricating film of oil. When sprayed under high pressure on Non-corrosive, the special fluid provides excellent anti-wear and anti-scuff protection for closely-fitted machine parts and is economically priced, adds Shell. In the photograph at the left the combustibility of conventional hydraulic fluid is shown when sprayed across a torch flame. At the right Shell Oil Co.'s fire-resistant 3XF(R) hydraulic mine fluid shows its non-combustible properties by refusing to burn.

B.F.Goodrich

B.F. Goodrich tires carry 44-ton gross loads for strip miner, still can be retreaded twice

J. Robert Bazley, Inc. of Pottsville, Pa., strip mines throughout the anthracite region, also builds roads all over the state. The company operates 217 rubber-tired vehicles working as many as 70 hours a week. The truck above carries 22 tons of rock and dirt overburden. Add the vehicle weight, and you have a 44-ton gross load for those tires to carry over razor-sharp rock!

Yet the tires can be retreaded *twice!* This is possible because the tires are B.F.Goodrich Rock Service tires—specially built for this kind of work. Massive double-chevron cleats defy rock cuts and bruises, pull in forward or reverse. B.F.Goodrich FLEX-RITE NYLON cords withstand double the impact of ordinary materials, resist heat blowouts and flex breaks. Result: this B.F.Goodrich Rock Service tire body outwears even the extra-thick tread, can be retreaded again and again!

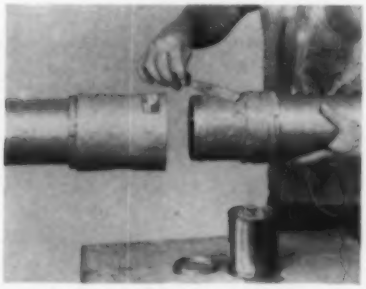
Follow the lead of successful strip miners like J. Robert Bazley. Switch to B.F.Goodrich Rock Service tires. You'll be dollars ahead. Your B.F.Goodrich Smileage dealer is listed under Tires in the Yellow Pages of your phone book. See him today. *The B.F.Goodrich Co., Akron 18, Ohio.*

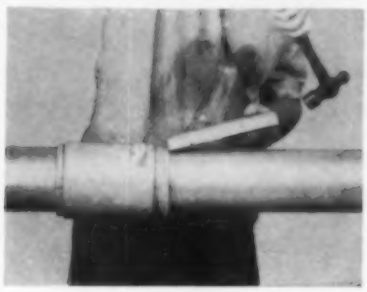
Specify B.F.Goodrich tires when ordering new equipment

Smileage!

B.F.Goodrich ***off-the-road tires***

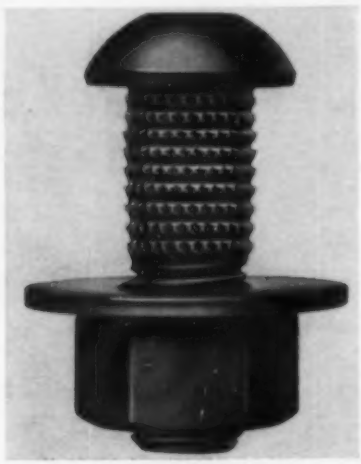
Equipment Developments





PLASTIC PIPE—Epoxy-and-fiberglass pipe that will not spark nor conduct electricity and is extremely light is now more adaptable with new corrosion-resistant fittings manufactured by Amercoat Corp., South Gate, Cal. The new fittings include 90- and 45-deg elbows, tees, couplings and other fittings for either threaded-end or plain-end Bondstrand pipe. Under test and soon to be released are flanged and fast-couple fittings made entirely of fiberglass and epoxy. These are expected to prove especially useful where make-and-break connections are desired. The plastic pipe comes in rigid 20-ft lengths in 2- to 8-in diameters. Larger sizes are available on order.

CAR SHAKER — Improved "unbalanced-motor" vibrating car shakers empty railroad hopper cars containing coal 10 times faster and cheaper than outmoded manual methods, according to Syntron Co., Homer City, Pa. A ratchet-wrench-type tightener takes up slack quicker and makes attachment simpler. The machine is hung on the side of the car so its powerful vibrations go through the car making it quiver from stem to stern, states the manufacturer. A 4-hp motor produces 850 vibrations per minute from 230 or 460 V, 3-phase, 60-cycle AC.



HIGH-STRENGTH BOLT—New structural bolts from Lamson & Sessions Co., Cleveland 9, are said to combine the tensile strength of a hex-head high-strength bolt with the bearing of a rivet and reportedly have the highest shear strength and greatest resistance to slip of all structural bolts. The bolts have a shank made with specially formed knurls, set on a spiral that reduces the driving load. Length of the knurled body is determined by thickness of the members to be joined. When the bolt is driven or pulled into place, the knurls produce a body-bound fit. Three design features make the bolts easy to position: the frontal shape of each knurl is a section of a small ball; the back face is relieved much like a drill or tap to prevent packing of displaced material; and the knurls are set on a spiral to reduce driving force.

MEDIUM-SIZE MOTORS—AC motors tailored to specific needs are now available from the Medium AC Motor & Generator Dept. of General Electric Co., Schenectady 5, N. Y. The new line of motors with ratings from 100 to 600 hp features a "square look" which results in savings in floor space, faster installation and greater accessibility for maintenance, declares GE. Installation is simplified by an enlarged conduit box and by lifting lugs integrally cast into the

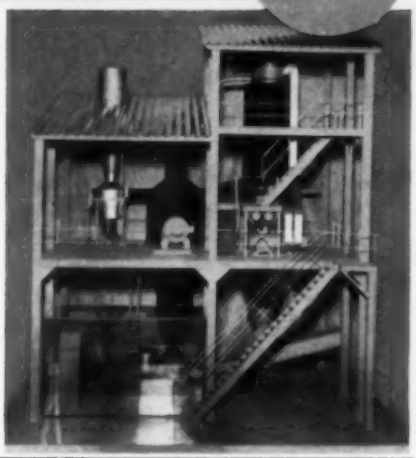
motor frame. New cast-iron flat end-shields weighing 70% less can now be handled by one man. Other advantages cited by GE are lower noise levels and greater overall ruggedness. Several insulation systems are available but the company particularly stresses its new "Polyseal" Class B system of supported silicone rubber. With this, say the firm's engineers, open motors may now be considered for some severe applications previously limited to totally enclosed motors. Polyseal offered in GE's form-wound motors consists of silicone, rubber-impregnated dacron, and glass tape wrapped around each coil in several layers. Before installation in the motor, each coil is vulcanized to bond the wrapping into a completely sealed protective layer.

ROTARY DRILL—Davey Compressor Co., Kent, Ohio, has come out with three new models of its Type 8 rotary drill. All are basically similar to Model M-8A (photo). This drill has rated capacity of better than 1,500 ft using 2⅞-in API drill pipe. Power comes from the truck engine through a Davey heavy-duty power takeoff, or the drill may be operated by a separate gasoline or diesel power unit. Compressor for "air-blast" drilling is a Davey 500-cfm machine said to supply ample air for hole cleaning and maximum drilling speed. The drill mast, with 25,000-lb working capacity, accommodates and 18½-ft kelly and 15-ft drill pipe. Model M-8AL has a special long kelly and mast and can drill 24-ft ledges without changing steels. Model M-8MA, third new drill, is a combination air-blast and mud-rotary rig and has several types of mud pumps to meet job requirements.

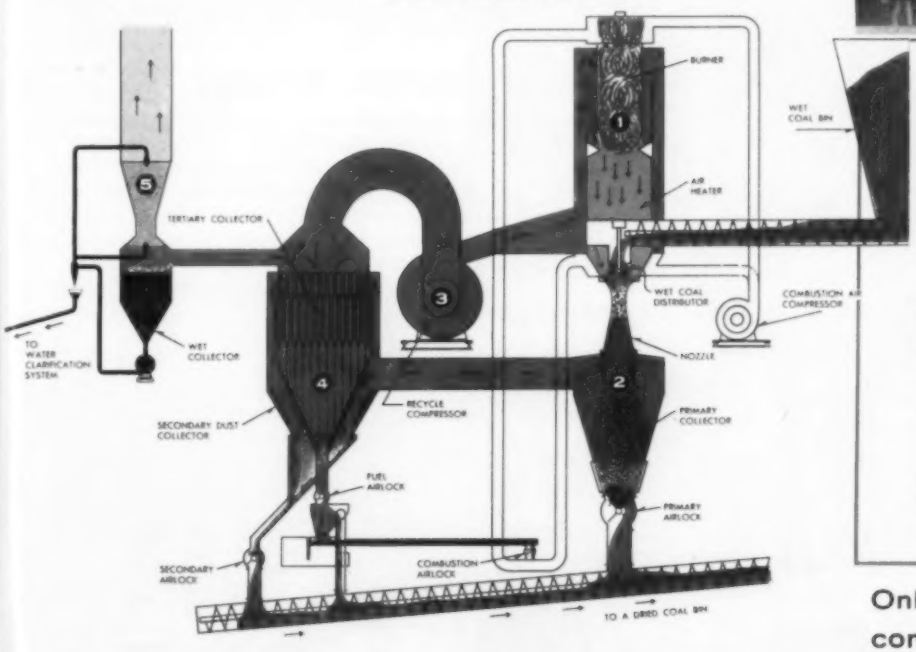
NOW... SAFETY... ECONOMY

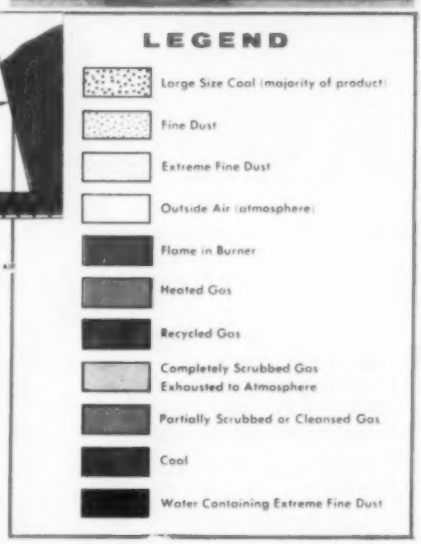
at High Thermal Efficiency and Low Product Temperature

FAIRMONT-built TAILOR STREAM-FLO THERMAL DRYER*



*Tailor Stream-Flo Thermal Dryer is the trade name for thermal dryers of Tailor and Co., Davenport, Iowa.





Surface moisture removed from coal and other solid materials without threat of explosion and internal fires!

This revolutionary achievement is accomplished by the new Tailor Stream-Flo Thermal Dryer that combines continuous pressurized drying at high thermal efficiency and low product temperature. Inert atmosphere, pressurized by a compressor system, assures non-turbulent action that is safe and economical.

The new Tailor Stream-Flo Thermal Dryer operates by gravity, dries feed products instantaneously up to 2" . . . recovers the finest dusts easily and effectively.

Only five major compact elements comprise the new Tailor Stream-Flo Thermal Dryer. Simplicity of their design eliminates costly auxiliary equipment, including ash removal and handling units; holds space requirements to a minimum; drastically reduces maintenance and repair.

Only five major elements comprise the entire Dryer system:

1. burner-heater with combustion air duct assembly
2. drying nozzle and primary collector
3. recycle compressor
4. secondary and integrated tertiary dust collectors; and
5. wet collector and exhaust duct for scrubbed gas

FAIRMONT MACHINERY COMPANY
FAIRMONT, WEST VIRGINIA

Bolt soft mine roofs Safely... use PATTIN'S

REVOLUTIONARY

*AIR-SEAL

RESIN PROCESS

CHECK THESE FEATURES –

- Resin penetrates soft shale around expansion shell, seals out air and prevents crumbling of sidewalls where shell is anchored
- Binds shell and strata together into one solid mass at anchoring end of bolt.
- Absolutely permanent anchorage — impervious to oxidation, water, oil, gas or acids. Ideal for haulageways and airways which must remain open for many years
- Extremely strong adhesion value, even on wet surfaces — high tensile and compression strength.
- Resin is pre-packaged in convenient container — no spilling—no contact with workman
- No special tools or equipment are required for its use.

Write for details and demonstration!

*U. S. Pat. No. 2,829,502. Other patents pending in the U. S. and foreign countries.

IN WESTERN STATES

Pattin expansion shells and Air-Seal process are available and serviced exclusively by The Colorado Fuel and Iron Corp., Denver, Colorado. Western mining companies should contact them direct for information and consultation.

← AIR SEAL RESIN CONTAINER

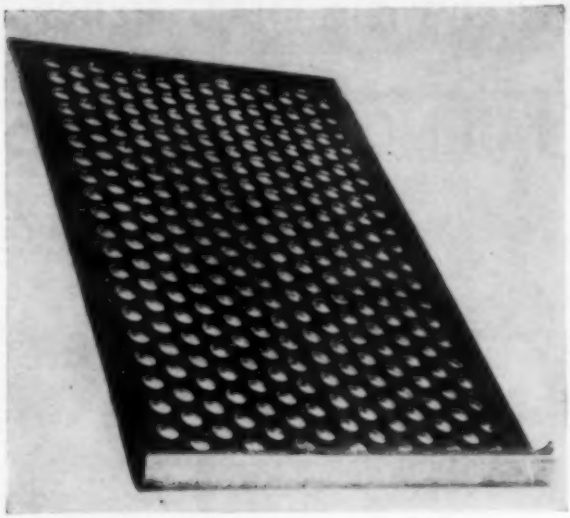
PATTIN

MANUFACTURING COMPANY

MARIETTA, OHIO

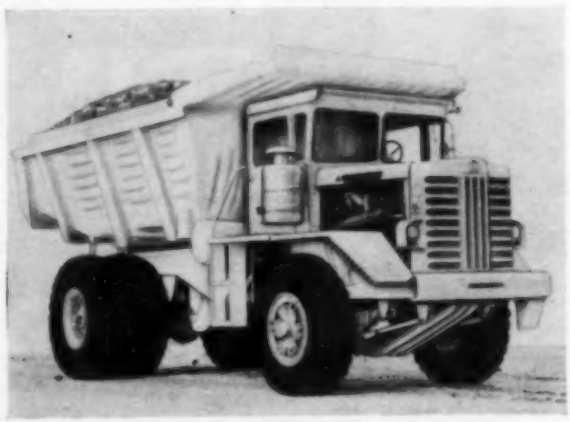
The PIONEER of roof bolting...established 1888

Equipment Developments



Rubber-Coated Screens

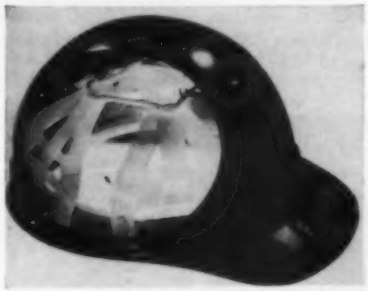
Rubber-clad steel perforated screens that have, say reports, outlasted conventional screening materials in ratios ranging from 5 to 1 to a high of 20 to 1, are products of the Hendrick Mfg. Co., Carbondale, Pa. Hendrick first bonds the rubber stock to steel plates under pressure. The joined sheets are then steam cured. The firm notes that high-quality rubber with the tough long-wearing qualities of the stock used for automobile tire treads is used on the screens, which come in a wide range of thicknesses.



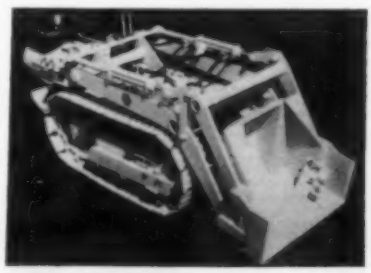
New Trucks

Two new Payhaulers from International Harvester Co., Chicago 1, featuring diesel engines and corrugated bodies are now in production. The units are the Model 95 (photo) with heated body and struck capacity of 18 cu yd and a 27-ton payload, and Model 65, with struck capacity of 12.5 cu yd and a 19-ton payload. The most powerful diesel ever built by International Harvester, according to the firm, powers both models. The larger machine develops maximum horsepower of 375 at 2,100 rpm while the smaller Model 65 develops 250 hp at 2,100 rpm. Both units offer fast reversing, up to 7.1 mph in the gear-drive Model 95, to speed spotting or positioning for dumping. Exclusive inverted hoist action on both models permits 11-sec dumping and keeps the pistons clean, adds the manufacturer.

Equipment News *(Continued)*



SAFETY HATS—An entirely new line of fiber glass, aluminum and plastic safety caps has been developed by Apex Safety Products, Cleveland 15. The new caps feature a polyethylene suspension that, the manufacturer says, provides the "ultimate in hard-hat safety." The suspension includes lock-straps at the peak which assure minimum 1¼-in clearance between crown and hat shell and yet maintain adjustment provisions for comfortable crown depth fit. The cap comes in one adjustable size to fit all head sizes from 6⅝ to 8 and has a plastic-zippered leather sweatband which may be replaced quickly without need of disturbing any part of the suspension, adds the firm.



AIR-POWERED LOADER—Machinery Center, Inc., Salt Lake City, Utah, is marketing an air-powered front-end loader and dozer. The crawler-loader is designed to work under headings as low as 4 ft and provides exceptional reach up to 6 ft dumping height, says the firm. A 15-hp reversible air motor runs the machine with direct drive. It has hydraulic steering clutches, 3-speed transmission with travel speeds to 5 mph and comes with bucket capacities of ¾, ⅞ and 1 cu yd. Air requirement is 315 at 80 psig.

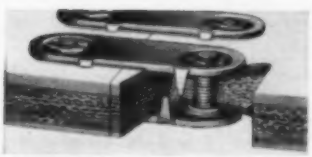
NEW SHOVEL - CRANE — Link - Belt Speeder Corp., Cedar Rapids, Iowa, announces a new ¾-yd shovel-crane. LS-78 with 12½ to 30-ton capacity, features "Speed-O-Matic" power hydraulic controls which, says the firm, can account for up to 25% more daily production than could be obtained from a shovel-crane with manual controls. Because of short-throw, finger-operated con-

NO BELT SPLICING PROBLEMS HERE...THEY USE

FLEXCO® FASTENERS!

(PHOTO TAKEN AT PEABODY COAL CO., MINE #10, PAWNEE, ILL.)

Tight production schedules require dependable belt fasteners!



Cutaway of a Flexco application showing the compression plates, teeth and precision-made bolts and nuts.

Daily, the thousands of "working" belt splices throughout the country are proving the superior holding power of FLEXCO joints (no other belt fastener is so widely used). Belt maintenance crews like to work with Flexco fasteners because they are easy to apply—joints last a long time — worn plates can be replaced quickly—ideal for repairing rips and tears.

PROTECT YOUR INVESTMENT IN CONVEYOR BELTS WITH FLEXCO . . . the quality fastener for all heavy-duty conveyor belt applications: COAL & METALS, SAND & GRAVEL, CRUSHED ROCK, CONSTRUCTION EQUIPMENT, etc.

Available in Steel, Monel, Stainless, Everdur. Also Promal top plates.

FLEXCO "25-PAK"

"25-PAK" contains enough fasteners to join common belt widths.

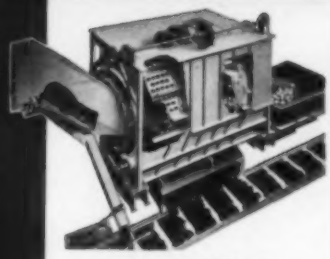
ORDER FROM YOUR DISTRIBUTOR, OR WRITE TO US FOR BULLETIN F-112.

"FOR THE SPLICE OF A LIFETIME"

Flexible STEEL LACING COMPANY

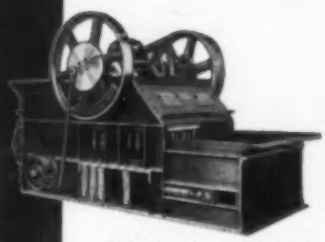
4638 LEXINGTON STREET • CHICAGO 44, ILLINOIS

America's most complete line of CRUSHING EQUIPMENT



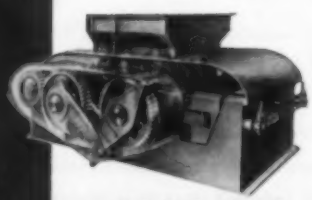
McNally Pittsburg Rotary Breaker

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



McNally Norton Vertical Pick Breaker

50% Less fines when reducing lump to egg and stove sizes.



McNally Double Roll Gearmatic ROM Breaker

Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.

McNally Gearmatic Stoker Coal Crusher

This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.

McNally Single Roll Crusher

Universal application 20", 24" and 36" diameter rolls.

AVAILABLE

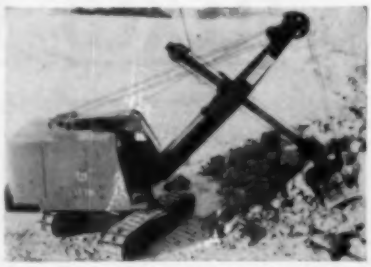
From Stock and on Short Delivery

For immediate action on complete information write, wire, or call.

McNALLY PITTSBURG MFG. CORP.

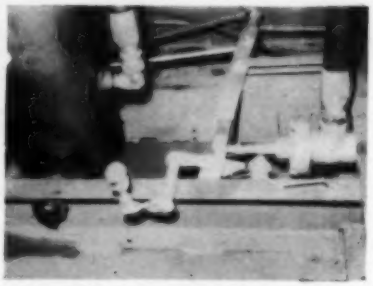
Pittsburg, Kansas Wellston, Ohio

Equipment News (*Continued*)



trol levers operator fatigue is a minimum, it is noted. Said to be versatile and maneuverable, the new machine's "Full-function" design permits using independent load-lowering clutches on either or both main drums.

TONG AMMETER—A new PB tong-test ammeter for measuring small amounts of DC in ½-amp divisions up to 10 amps, has been introduced by Columbia Electric Mfg. Co., Cleveland 14. In addition, Type PB can be used to read both AC and DC up to 20 amps. Measurements are taken easily and quickly, states the firm, by clamping the tongs around the electrical conductor without breaking the circuit of insulation. Jaws can accommodate conductors up to ½-in in dia.



LOCKING DEVICE—Vibration and wear in dump trailer bodies may now be eliminated with a new locking device, reports Trailco Mfg. & Sales Co., Hummels Wharf, Pa. Its new "Lock-O-Matic," states the company, reduces wear on the body, chassis and packing glands of the hydraulic lift. Heavy spring-loaded clamps secure the body to the frame while on the highway. When the hydraulic system is engaged to start the lift operation an interim valve activates a clearing control on the mechanism and the clamps are freed of the trailer body. When the body is returned to road position the clamps automatically engage and lock in position.

FRONT-END LOADER—A new 2-yd, 4-wheel drive front-end loader, Lorain "MotoLoader," has been announced by The Thew Shovel Co., Lorain, Ohio. This new model, replacing Moto-Loader Model ML-156, is the result of extensive market research, states the company. Features include: lift-arm geometry eliminating hazardous "scissor action"; one-foot control of travel direction and speed resulting in smooth cycles leaving hands free for other operations; good work visibility even when all-weather cab is used; and all controls located for easy operation. A 6-cylinder gasoline engine developing 105 hp at 2,200 rpm supplies speed from 3 to 24 mph. Operating ranges match today's requirements and weight distribution and low center of gravity give the Lorain ML-157 unusual balance and stability, according to the manufacturer.

Equipment Shorts

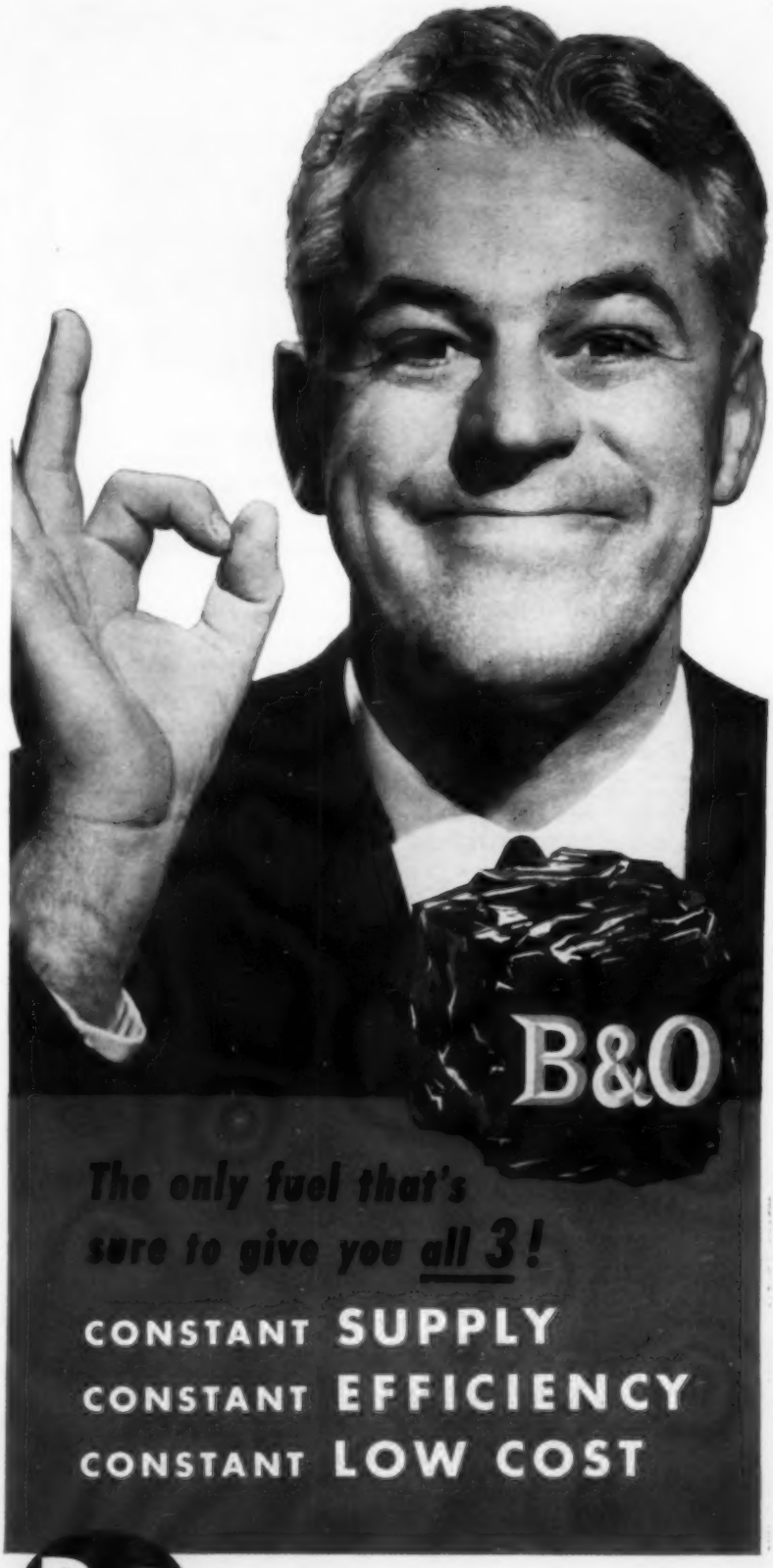
Cutting Tool—For cutting precision holes and shapes in thick metal plate a new patented tool priced less than $40 may be obtained from Ideas, Inc., Laramie, Wyo. Developed for use by the Navy, the tool attaches to any acetylene cutting torch for applications such as cutting holes through metal walls and decks for pipe and electrical conduit. Because of the tool's small size, it will operate in confined spaces, heretofore usually performed by laborious and expensive free-hand cutting, says the manufacturer.

New Hoist—Increased versatility with lightweight electric hoisting equipment is provided with a link-chain model of the Midget King Hoist from Yale Materials Handling Div., The Yale & Towne Mfg. Co., Philadelphia 15. Produced in link- and roller-chain models in ⅛-, ¼-, ½-, 1- and 2-ton capacity models, the new Midget King lifts by means of durable, alloy-type link chains which flex in any plane to allow picking up material not directly under the hoist.

Timing Belt—"Time-Tex" timing belt drive constructed with steel cable cords imbedded in Neoprene fully molded with a nylon-base fabric has been announced by Allis-Chalmers Mfg. Co., Milwaukee 1. With the timing belt drive speed is transmitted uniformly without rise and fall of pitch line, thereby eliminating chatter and vibration, states the firm. The drive makes possible a range of speed to over 16,000 fpm, according to Allis-Chalmers.

Detects Faults—A new pressure relay using a pressure differential or equalizing feature to detect false operation and prevent a power transformer from operating in a damaged condition is being marketed by General Electric Co., Schenectady 5, N. Y. The relay is designed to respond only to internal transformer faults and not to line through-faults, systems surges or mechanical shock and vibration. It signals circuit breakers to open and deenergize the unit.

Density Discharge Control—This "Dowsett" valve from Denver Equipment Co., Denver 17, Colo., for Jig hutch products and similar applications, consists of a housing and diaphragm-operated valve. The diaphragm keeps the valve closed because of water pressure against the larger area of the diaphragm. When enough solids are accumulated to overcome the differential in pressure, the valve opens and discharges at 70 to 80% solids. No water is wasted, says the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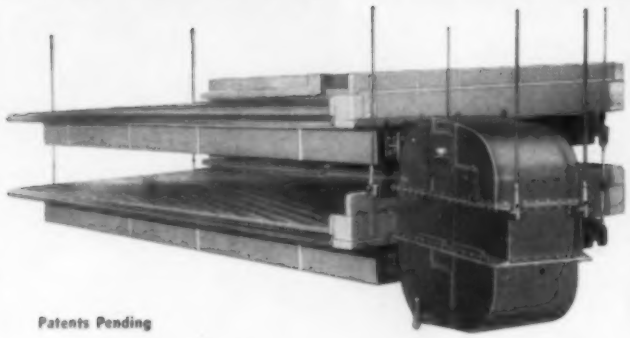
The only fuel that's sure to give you all 3!
CONSTANT SUPPLY
CONSTANT EFFICIENCY
CONSTANT LOW COST
B&O
BITUMINOUS COALS FOR EVERY PURPOSE
Ask our Man! BALTIMORE & OHIO RAILROAD, BALTIMORE 1, MD. Phone LExington 9-0400



Patents Pending

The CONCENCO® 77 Twin-Deck Table Offers 3 MAJOR ECONOMIES

Here is a revolutionary concept that cuts cost of preparation in three major ways:

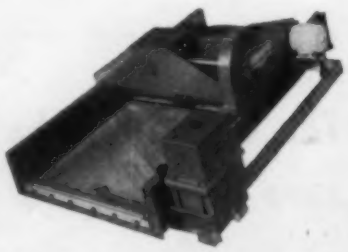
1. By placing two identical decks in floating suspension, one over the other, it doubles washing capacity in the same unit of floor space.
2. It enables the operator to increase his capacity in easy stages by replacing one or more tables at a time until he has doubled his capacity.
3. When new housing is required, lighter construction is possible because the floating suspension materially reduces vibration and impact to the building.

In addition to these important economies, the 77 table offers an additional advantage—if floor space is needed for other purposes, your present capacity can be maintained in as little as half the area you now require.

For full information, send for Bulletin 77.

For Screening Economy

All New Model Leahy® screens utilize proven differential vibration that snaps oversize wedging particles loose 1600 times per minute. When dust is a problem, totally enclosed models are most effective. For damp screening, Flex-Elex® electric heating of the screen jacket insures full-time open mesh. For efficient wet screening CONCENCO® spray nozzle arrangements are your answer.



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COMPANY
923 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company • Inc. 1906*

manufacturer, because only high-density pulps are discharged.

Free Bulletins

Connectors—A fully illustrated catalog describes Joy's complete line of electrical connectors for industry. The brochure also lists electrical current ratings for cable as based on wire gages and number of wires. Catalog B73, Electrical Products Div., Joy Mfg. Co., St. Louis 10.

Lubricants—A new bulletin "Lubrication of Roller and Silent Chain Drives," covers principles of lubrication, maintenance and oil selection. Sun Oil Co., Industrial Products Dept., Philadelphia 3.

Vibrating Screens—A complete variety of vibrating screens are presented in a new 48-p booklet which also contains information on screen cloths and accessories. Complete tables of materials, selection data, easy-to-read drawings and cut-away photographs showing construction features are also given. Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1.

Television – Closed - circuit television and 30 specific applications from mining through the finishing of steel is the subject of a new booklet from Diamond Power Specialty Corp., Electronics Div., Lancaster, Ohio.

Wire Rope—A 4-p service bulletin titled "Matching the Wire Rope to the Job" has been prepared. It provides specific recommendations for various jobs and equipment and in many cases 2 or 3 choices are provided depending on special circumstances under which the equipment may be working. Bulletin No. 107, Leschen Wire Rope Div., St. Louis 12.

New Idlers—Two new series of heavy-duty belt-conveyor idlers are thoroughly described in a new bulletin. Designed for heavy-duty handling of large lumps and heavy materials at high speeds, these new idlers combine precision-made tapered roller bearings with large shafts, heavy rolls, rugged stands and a new grease seal. Barber-Greene Co., Aurora, Ill.

Compressors—A new 8-p bulletin describes and illustrates the Pennsylvania 3-AT compressor—a horizontal water-cooled single-stage compressor, designed for use in approximately 9 out of 10 compressed-air applications, according to the manufacturer. Bulletin 350, Penn-

Equipment News (*Continued*)

sylvania Pump & Compressor Co., Easton, Pa.

Weighing—Streeter-Amet Co., Grayslake, Ill., has a booklet entitled "Industrial Weighing Through Electronics." The history and development of electronic weighing, theory of operation, instrumentation and remote recording are discussed.

Engine Line—A complete line of engines for mining use is described in an 8-p booklet by Caterpillar Tractor Co., Engine Div., Peoria, Ill. The catalog summarizes the specifications of all current models and includes photos for ready reference.

V-Belts—"Custom Made V-Belts with Alligator V-Belt Fasteners" is the title of a new bulletin from Flexible Steel Lacing Co., Chicago, Ill. Information is offered on the use of the fasteners with open-end V-belting, how to determine belt length, and points to remember when designing new drives.

Cutting Machines—The complete line of rubber-tired cutting machines made by Goodman Mfg. Co., Chicago 9, is the subject of new catalog G138, available on request.

Motors—Booklet GEA-6704 describes construction features and applications of helical gear-motors and speed reducers. Cutaway drawings show maintenance features and other information is provided on field and factory testing help. General Electric Co., Schenectady 5, N. Y.

Insulation—New insulation for rewound motors is discussed in a new booklet from Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa. It lists industry applications for which the solventless epoxy encapsulation is best suited and outlines its physical and chemical properties.

Steel Doors—Specifying and installing industrial rolling steel doors is treated in a new booklet published by the Rolling Steel Door Div. of the R. C. Mahon Co., Detroit 34, Mich. The 16-p pamphlet gives requirements for installation, specifications for both manual and automatic power operation, special weathering, windlocks, fire retarding and other materials to meet needs.

Belt Conveyors—A new 88-p catalog shows principal belt-conveyor products made by Continental Gin Co., including heavy-duty and standard roller bearings and precision ball-bearing idlers. Catalog ID-591, Materials Handlings Dept., Birmingham 2, Ala.

Belt Conveyors—A new 88-p catalog shows principal belt conveyor products made by Continental Gin Co., including heavy-duty and standard roller bearing and precision ball bearing idlers. A section of engineering data contains simplified and condensed information for proper selection of belt conveyors and related equipment. Catalog ID-591, Birmingham 2, Ala.

Rubber Pipe — A booklet describing Condor flexible rubber pipe for use wherever corrosion, abrasion, vibration or thermal expansion would necessitate excessive replacement of conventional pipe, is available from Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.

Rock Dust Distributor — New MSA Model 80 slurry rock dust distributor for machine mounting is the subject of a new bulletin prepared for the mining industry by Mine Safety Appliances Co., Pittsburgh, Pa. Appropriate dimensional data lists tank capacity, discharge rate and operating time for a complete cycle (one batch) of rock dust mix. Details of typical applications and catalog numbers for unit parts are also included.

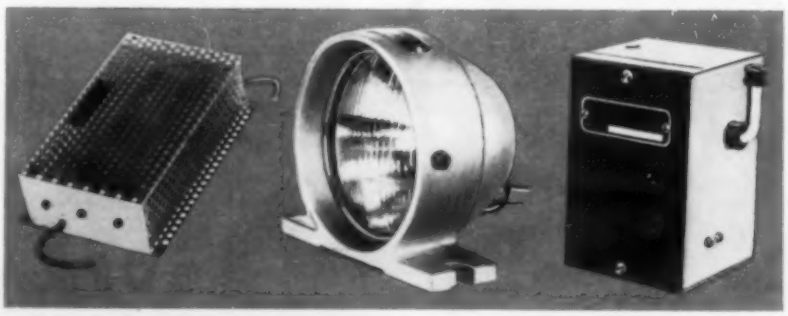
Wheels, Rollers — Bartlett & Snow Co., Cleveland 5, Ohio, has a catalog with a stock list of specifications and data on the firm's wide line of track wheels and rollers. They are designed for use on materials-handling equipment, industrial cars, trippers, larries, conveyors or a wide variety of track- or rail-supported machinery.

Air Control — A new 16-p composite product bulletin containing a description of American Air Filter Co.'s complete line of products has been released. Bulletin No. 518 illustrates and describes its products for air filtering, cooling, cleaning, moving, exhausting, humidifying and dehumidfying air. Central Ave., Louisville 8, Ky.

Pushbutton Stations — Corrosion-resistant surface-mounted NEMA Type 4 and 5 pushbutton stations and pilot lights are described in new literature from Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. The stations are available as a single unit with momentary contacts, two units with momentary contacts, two units with maintained contacts, two with one momentary and one maintained contact, single unit with pilot light and two units with pilot light.

Tractors—Eimco Corp., Salt Lake City 10, Utah, announces publication of a 16-p booklet covering their Eimco 105 series of tractors and tractor units.

Guyan | HEADLIGHT RESISTORS
SEALED-BEAM HEADLIGHTS
HEADLIGHT SWITCHES



Guyan HEADLIGHT RESISTORS
For safety, long life and prevention of frequent burn-outs. Designed with ample capacity for your trolley voltage and the correct bulb voltage.

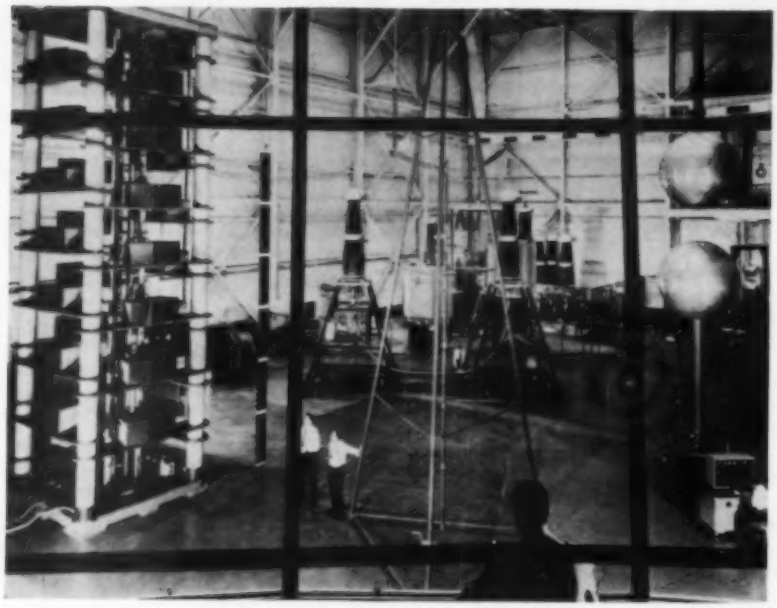
Guyan SEALED-BEAM HEADLIGHTS
PAR-46 sealed-beam lamps, encased in steel; with three lamp voltages:—heavy-filament 6-volt; long-lasting 32-volt; and current-saving 115-volt.

Guyan MERCURY TUBE HEADLIGHT SWITCHES
Non-arcing. Extra capacity. No weak parts to wear.

A HEADLIGHT PACKAGE—consisting of two Headlights (specify voltage desired), one headlight Resistor and one mercury tube Switch is available, as well as the individual items. Write for details.

Manufactured by **GUYAN MACHINERY CO.** LOGAN, W. VA.

Among the Manufacturers



Anaconda Wire & Cable Co. has opened a new extra-high-voltage research laboratory at Hastings-on-Hudson, New York (photo).

Costing $1,750,000, it contains equipment for evaluation of EHV cable and accessory designs. In addition to 60-cps AC and impulse-voltage testing, facilities are provided to cyclic-load test simultaneously at 150% rated voltage at operating or higher temperatures six 150-ft lengths of full-sized (2,500 Mcm) commercial 345-kv cable complete with joints and terminals.

Radio Corporation of America appointed representatives at Buffalo, N. Y. and Charleston, W. Va., for its mobile communications equipment.

Eastern Theatre Supply Co., Inc., Buffalo, will sell RCA two-way radio equipment in the northwestern section of New York State, and Electronic Specialty Co., Charleston, W. Va., was assigned the western portion of West Virginia.

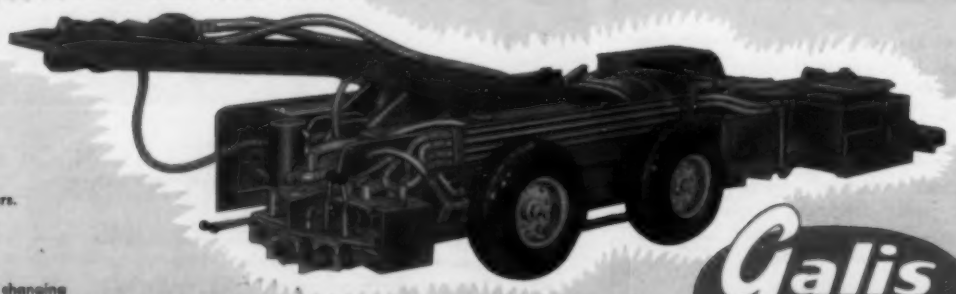
Air Reduction Sales Co., Div. of Air Reduction Co., Inc., has completed a new oxygen and nitrogen plant at Denver, Colo.

The plant is the first major gas-producing installation built by Air Reduction in that area, and was prompted, according to the firm, by the rapid and continuing growth of industry in the Rocky Mountain region in recent years. The oxygen and nitrogen will be used for various purposes, including metal work-

HANDY CONTROLS FOR . . . one man operation

Men like a *safe* mine . . . Inspectors like a *clean* mine . . . Operators like economical operation . . . Such as given by the . . .

GALIS Roofmaster



Greatest Drilling Speeds
156-42" Bolts in 5 hrs. (Name on request.)

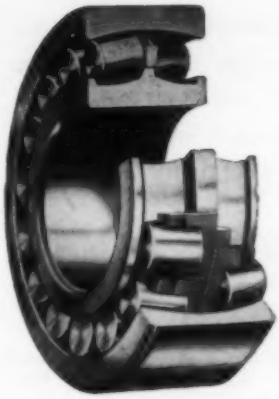
Greatest Economy
No stopping for changing feed parts.

Greatest Maneuverability
Three point suspension, 4 wheel drive, each side positive control.

Dimensions:
Overall height, 24". Ground clearance, 5". Overall length with cable reel, 174". Overall length without cable reel, 160". Overall width, 61" over wheels. 5" stabilizing jack. Standard feed length, 53". Oil Tank capacity, 60 gals. Available H.P., 15.

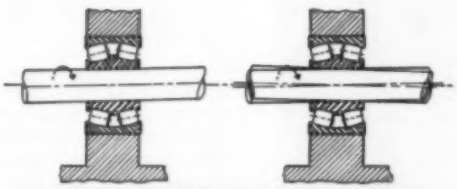
Galis
ELECTRIC & MACHINE CO.
MORGANTOWN, W. VA.

Write or Phone Morgantown 4662

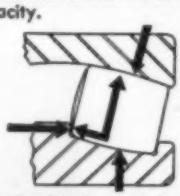


WHY TORRINGTON SPHERICAL ROLLER BEARINGS

mean superior performance, longer life

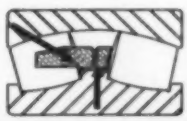


Self-Aligning Spherical Design allows compensation *within* the bearing for initial or dynamic misalignment up to 1½° in either direction and still maintains full radial and thrust capacity.

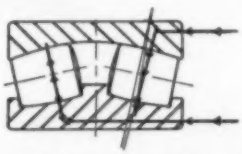


Positive Roller Guidance is doubly assured by the Torrington design: 1. Approaches the design of a true rolling cone. 2. Under load, the spherical roller seeks positive contact with the center guide flange because of its basically conical shape. This assures geometric stability, accurate guidance, lower friction and truer rolling.

Conformity of Precision-Ground Races to Rollers gives maximum load capacity and even load distribution. Optimum conformity of roller end to center guide flange prevents skewing.



Land-Riding Bronze Retainers, fully machined, operate with minimum friction. Each row of rollers operates independently under thrust loads without drag or side pressure from adjacent row.

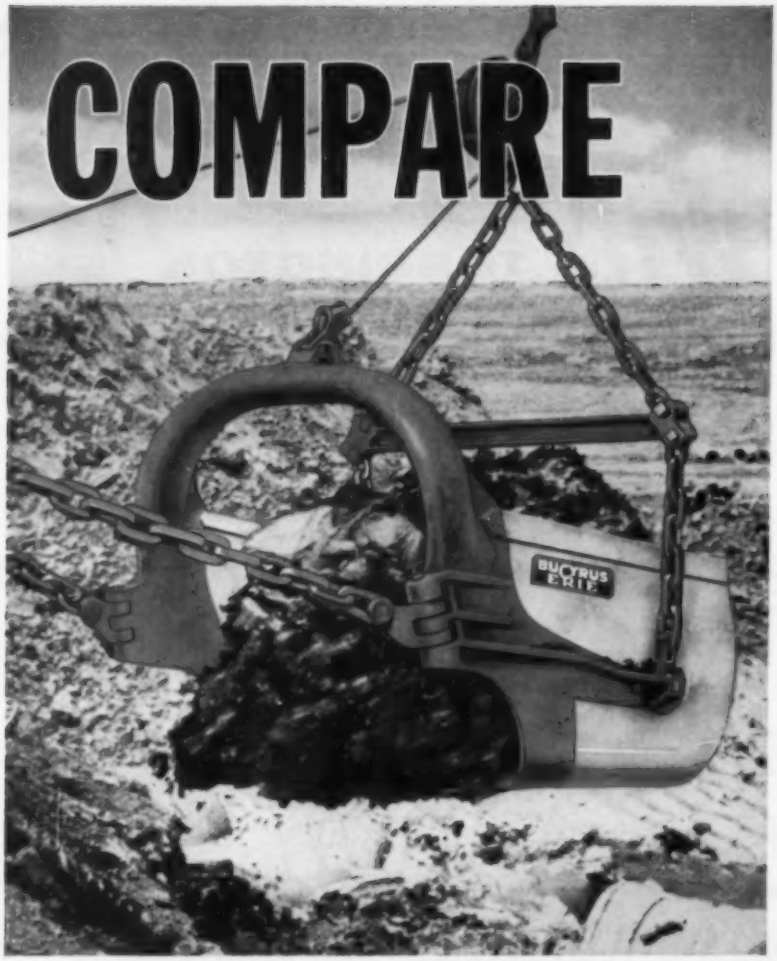


Takes Thrust Loads. Angular design effectively handles end thrust due to load conditions, misalignment or other causes.

These are only a few of the features of Torrington Spherical Roller Bearings that make them your best buy for replacement needs. And for fast service, turn to your *Authorized* Torrington Bearing Distributor. He maintains complete stocks of Torrington bearings and can advise you on the latest installation and maintenance procedures. THE TORRINGTON COMPANY, South Bend 21, Ind.—and Torrington, Conn. District offices and distributors in principal cities of United States and Canada.

TORRINGTON BEARINGS

NEEDLE BEARINGS • CAM FOLLOWERS • HEAVY DUTY NEEDLE BEARINGS • ROLLER THRUST BEARINGS • NEEDLE THRUST BEARINGS



...and you'll buy BUCYRUS-ERIE

compare output Watch the "slicing action" lip take a faster bite, regardless of material . . . watch the tapered basket fill smooth and fast . . . watch it ride through the swing, smooth and even without bobbing and spilling . . . and watch the high-speed dump made possible by a clean inside design and high arch!

compare economy Ask others about long-life Bucyrus-Erie buckets! BECOLOY — a specially developed Bucyrus-Erie alloy — not only makes the buckets lighter, but adds great strength and wearing ability with higher impact resistance.

Your Bucyrus-Erie distributor will give you complete information on the complete line, all types, including solid and perforated; light, medium and heavy-duty. Call him today, or write Bucyrus-Erie Co., South Milwaukee, Wisconsin, Dept. 1R.

BUCYRUS ERIE® **Builds Better Equipment**

Manufacturers *(Continued)*

ing, construction and missile development.

Chicago-Wilcox Mfg. Co. has been appointed servicing distributor for United States Rubber Co.'s Mechanical Goods Div.

Chicago-Wilcox will handle all packings in the U. S. line such as sheet, pump, asbestos, canvas, expansion, metallic, Teflon, solvent and other types.

Koehring Div. of Koehring Co. named Equipment and Supplies, Inc., Pittsburgh, to distribute Koehring trademark products.

The new distributorship will include the complete line of Koehring excavators, truck-, "Cruiser"- and crawler-mounted cranes as well as other heavy-duty equipment.

Chicago Pneumatic Tool Co. purchased the assets of the Reich Bros. Mfg. Co., Inc., producers of the Reich line of truck- and crawler-mounted hydraulic rotary blast hole drills and drilling rigs.

The present personnel of the acquired organization will continue in their regular capacities.

C. E. McWhorter

New appointments at Goodman Mfg. Co. have been announced.

Elevated to the new position of manager of mining product development is **C. E. McWhorter,** who has served as manager of the firm's Denver district and recently as mining engineer. Succeeding Mr. McWhorter as mining engineer is **K. E. Caine** who has moved to Chicago from his post as manager of the Pittsburgh sales disrict.

O. L. Robertson, former manager of the Service Engineering Div. of Exide

Manufacturers (*Continued*)

Industrial Div., The Electric Storage Battery Co., has been named motive power market manager.

James E. Gleason has been named assistant sales manager of Barber-Greene Co.'s Conveyor Div.

A graduate in Mechanical Engineering from Bradley University, Mr. Gleason joined the Barber-Greene organization in 1954.

Jeffrey Mfg. Co. has named several new regional managers.

Howard S. Davies, previously of the Pittsburgh office, will be responsible for the field activities of the Bluefield, W. Va., Columbus, Cincinnati, Cleveland and Pittsburgh districts. **Paul Hendry** replaces Mr. Davies as Pittsburgh office manager. **Elmer F. Longnecker** becomes regional sales manager, central region. He will coordinate activities at the Chicago, Detroit, Milwaukee and St. Louis trading areas. **William W. Etchberger** replaces Mr. Longnecker as Detroit district manager.

Cummins Engine Co. has appointed Vernon Hill to its sales staff.

Mr. Hill will specialize in the construction market, contacting manufacturers, contractors and other power users in the construction and mining fields.

Joy Mfg. Co. has announced new appointments in its Coal Machinery Div.

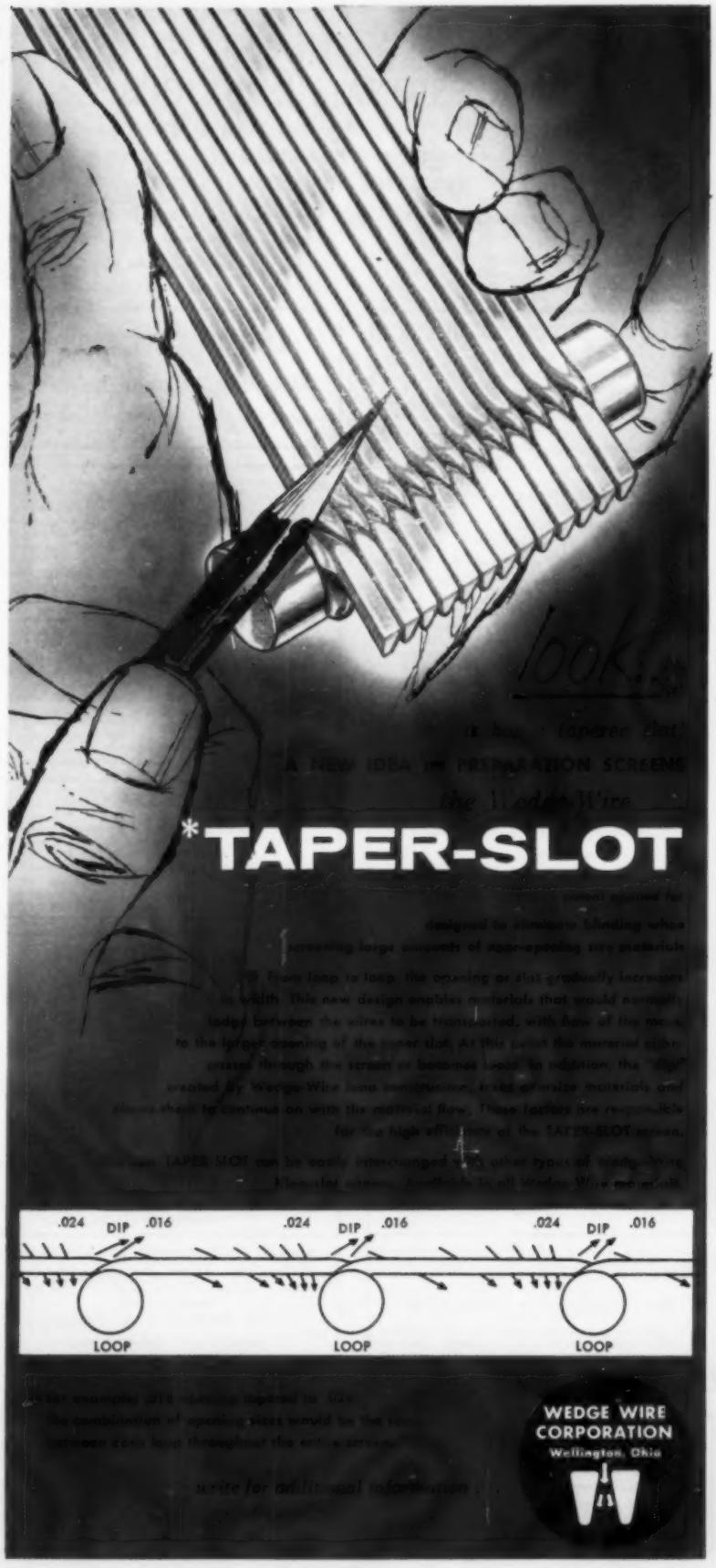
A. W. Calder, previously manager of the Continuous Miner & Loader Dept., has been named director of engineering. **John Merck** has been appointed manager of engineering for products manufactured at Joy's Franklin, Pa., plants. Appointed chief engineers for Joy's coal machinery products lines are: **C. W. Fitzgerald,** shuttle cars; **T. B. Bodmer,** loaders; **K. E. McElhattan,** continuous miners; and **C. P. Baldwin,** cutters and drills.

The appointment of five assistant district managers for Hercules Powder Co.'s Explosives Dept. has been announced.

They are: **Robert E. Good,** Chicago office; **William D. Cashin,** Joplin, Mo., district; **Allen T. Keel,** Birmingham, Ala., district; **Robert F. Kelleher,** Pittsburgh, Pa., district; **Robert N. Whisenant,** San Francisco, Cal., district.

H. E. Smith and Leon D. Smith have been appointed sales representatives for Leschen Wire Rope Div., H. K. Porter Co., Inc.

H. E. Smith will handle the territory including most of Kentucky and Tennessee, Alabama and western Florida. Leon Smith's territory covers Virginia and West Virginia.



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Specialists in exploratory—grout hole and pressure groutings. Rigs located in over 50 strategic areas for prompt service. Free estimates.
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EMPLOYMENT OPPORTUNITIES — $21.00 per inch, subject to Agency Commission.

UNDISPLAYED RATE
(Not available for equipment advertising)
$1.50 a line, minimum 3 lines.
POSITIONS WANTED undisplayed rate is one-half of above rate, payable in advance.
Box numbers—Count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

BEST BELT BUYS
2500-3000# cover tensile, 16-19# friction pull. Brand new, factory guarantee, 3 weeks delivery.

		List price	Sale price
4 ply 28 oz. duck:			
14"	1/8" x 1/32"	$4.30	$2.43
16"	1/8" x 1/32"	$4.86	$2.74
18"	1/8" x 1/32"	$5.39	$3.04
18"	1/8" x 1/16"	$5.68	$3.20
20"	1/8" x 1/32"	$5.90	$3.32
24"	1/8" x 1/32"	$6.95	$3.92
4 ply 32 oz. duck:			
24"	1/8" x 1/16"	$7.79	$4.14
30"	1/8" x 1/16"	$9.30	$4.99

Many other sizes. Samples free. Distributors protected.
Paltech Co. New Canaan, Conn. WO 6-4073

FOR SALE CHEAP
15000 ft NEW 3/4" galvanized wire rope. Sample on request
IRONTON PRODUCTS CO. IRONTON O.

2 TELPHONES $22.75
Inter-communication handsets, two wire system. Included Two 3 volt batteries, 50 ft. of wire and simple wiring instructions. Additional wire 1 cent per ft. or $25.00 per mile. Complete list of telephone parts, handsets, magneto—common battery — and dial telephones, switchboards, etc. All shipments FOB Simpson, Penna.
Telephone Engineering Co., Dept. CA-69, Simpson, Pa.

FOR SALE CHEAP
two NEW IRONTON mine locomotives
one trolly style TO48
one battery style WO track gauge 42"
IRONTON PRODUCTS CO.
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20# — 30# — 40#
NEW RAIL IN STOCK
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WORLD'S LARGEST INVENTORY
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Lease or purchase—large or small tracts. Morgan Coal Company, 2850 North Meridian Street, Indianapolis 8, Indiana.

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You can save yourself a lot of time and money when you want to Buy, Sell, or Trade Mining Equipment, Rails, Copper Wire or Supplies, new or used, only quantity, large or small. Just call J. T. FISH. The answer is always yes!

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JOY EQUIPMENT—REBUILT

3—Joy 14-BU Loaders, low pedestal, 7AE.
2—Joy 14-BU Loaders, medium pedestal, 7RBE.
1—Joy 14-BU Loader, high pedestal, 7CE.
6—12BU10E Joy Loaders complete with Piggy-Backs.
2—Joy 12-BU Loaders, 9E, latest type.
1—Joy 12-BU Loader, 220 volt AC.
1—Joy 20-BU Loader, latest type.
1—Joy 11-BU Loader, latest type.
2—Joy 8-BU Loaders, 250 volt DC.
1—Joy 8-BU Loader, 34" overall height.
2—Joy 8-BU Loaders, 220 volt AC.
1—Joy curved Bar Head, complete.
6—Reliance 24-J Motors, 7½ H.P.
4—Reliance 10-J Motors, 5 H.P.
20—9-J Motors, 4 H.P.
1—Goodman 660 Loader on cats, excellent.
1—Goodman 665 Loader on cats, latest type.
1—Goodman 865 Loader, 26" hi.
2—Joy 6SC Shuttle Cars, rebuilt.
3—Joy 6SC Shuttle Cars, latest type.
2—Joy 5SC Shuttle Cars, rebuilt.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars, rebuilt.
2—Joy 32E15 Shuttle Cars, rebuilt.
4—Joy 32E16 Shuttle Cars, rebuilt
2—Joy 42E16 Shuttle Cars, rebuilt.
8—Small Rubber-Tired Shuttle Cars.
3—Low Vein Rubber-Tired Tractors.
3—Joy CD-22 Drills, like new.
10—Joy T-2-5 low pan Cat Trucks.
1—Joy T-2-6 low pan Cat Truck with reel.
2—Joy T-1 Standard Cat Trucks, 220 AC.
1—Joy T-1 Standard Cat Truck, 250 DC.
2—Goodman low pan Cat Trucks, like new, latest type.
4—Joy 11-B Cutting Machines, like new. 35 & 50 H.P.
1—Joy 7-B Cutting Machine, like new, 250 volt DC.
2—Goodman 212 Cutting Machines, 19" high.
4—Goodman 312 Cutting Machines, 17" high.
3—Goodman 412 Cutting Machines, 19" high.
2—Joy 7-B Cutting Machines, 220/440 volt AC.
1—Goodman Machine on Cats, 31" high. All hydraulic
6—Goodman 512 Machines with Bugdusters.
1—Goodman 512 Cutting Machine, perfect.
3—Goodman 112 Cutting Machines, 220/440 volt AC.
1—Lee Norse low vein Machine Carrier on rubber.
1—Jeffrey 70 URB, rubber-tired Cutter, Universal head, perfect condition.
2—Joy 11RU Rubber Tired Cutters with bugdusters, Universal head, like new.
1—Sullivan 7AU on rubber. Universal head.
4—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on cats, 250 volt DC.

LOCOMOTIVES

1—Goodman 6 ton 91-A, 27" high, armor plate frame.
2—Jeffrey 13 ton, type MH-110, 36", 42" and 44" Ga.
2—Jeffrey 10 ton, type MH-110, 42" and 44" Ga.
2—Goodman 8-30 and 10-30 Locomotives, 26" above rail.
1—Jeffrey MH-124, 6 ton, 24" overall height.
12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" Ga.
4—Jeffrey, 8 ton, type MH-100, 2½" armor plate frames.
1—Jeffrey, 6 ton, type 2186, 22" above rail.
3—Jeffrey, 4 ton, type MH-96, 42", 44" and 48" Ga.
1—G.E., 4 ton, type 825 Locomotive, 22" high.
10—G.E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
1—G.E., 8 ton, type 822 Locomotive, 44" Ga.
3—G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" Ga.
2—Goodman, type 32, 6 ton, 44" and 48" Ga.
3—Goodman, 8 ton, type 32A, 36", 44" and 48" Ga.
3—Westinghouse, type 902, 4 ton, 42" and 48" Ga.
2—Westinghouse, type 904, 6 ton, 44" and 48" Ga.
2—Westinghouse, type 906, 44" and 48" Ga.
2—Westinghouse, type 907, 10 ton, 44" and 48" Ga.
8—Jeffrey MH-78 Locomotive Units, cheap.
4—Jeffrey MH-88 Locomotive Units, real bargains.
6—Jeffrey MH-100 Locomotive Units, reasonable.
Locomotive Trucks and Spare Armatures for all the above.
3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" Ga.

TIPPLE EQUIPMENT

5—Complete Tipples, 3 to 5 track, steel and wood.
3—Cleaning Plants, 1 Ea. McNally, Roberts and Schaefer, Jeffrey, Washers and Air-flo Tables.
4—Complete Aerial Trams for coal or refuse.
3—Complete Rope and Button Lines.
2—Monitor Lines complete with Drums, excellent.
1—Allis Chalmers 5 x 12 Low-Head Vibrator.
2—Allis Chalmers 5 x 14 Rippflo Vibrators.
2—Robins 5 x 14 double deck Vibrators.
1—Robins Gyrex Vibrator, 4 x 10.
10—Belt and Apron type Loading Booms.
6—Shaker Screens.
1—Robins Car Shakeout.
20—Crushers, various sizes.
Feeders, Belt and Drag Conveyors, Car Retarders, etc.

CUTTING MACHINES

2—Joy 11RU's, rubber tired, Cutter.
1—Jeffrey 70 URB Cutter, rubber-tired, Universal Head, low vein.
2—Jeffrey 29UC Universal Machines on Cats.
1—7AU Sullivan on rubber. Universal head.
1—Goodman on cats, 31" overall height.
3—Baby Goodman 212's, rebuilt, 250 volt DC.
2—Goodman 212 Cutting Machines, 19" high.
4—Goodman 312 Cutting Machines, 17" high.
3—Goodman 412 Cutting Machines, 19" high.
6—Goodman 512's with Bugdusters, like new.
4—Goodman 512's, rebuilt, or as removed from service.
3—Goodman 112's, 220/440 volt AC.
2—Joy 7-B Cutting Machines, 220/440 v. AC.
1—Joy 7-B Cutting Machine, 250 volt DC.
4—Joy 11B Cutting Machines, rebuilt, 35 & 50 H. P.
10—Goodman 12AA's and 112AA's, 250 v. DC.
2—Goodman 324 Slabbers.
2—Goodman 724 Slabbers.
6—Jeffrey 35L's, like new, 17" high.
3—Jeffrey 35L's, on low vein trucks.
15—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
2—Jeffrey 29C's track mounted.
2—Jeffrey 29L's on track, perfect.
2—Jeffrey 29L's on cats. Excellent.
3—Sullivan CE7, 220 volt AC.

LOADING MACHINES

6—Joy 12BU with Piggy-Back Conveyors
16—Joy Loaders, 8BU, 11BU, 12BU, 14BU, 20BU.
1—Goodman 865 Loader, 26", on cats.
1—Goodman 665 Loader, on cats.
1—Goodman 660 Loader, on cats.
1—Goodman 460, rebuilt, on track.
2—Jeffrey 61 CLR's, on rubber, 26".
3—Jeffrey L-500 Loaders.
2—Myers Whaley No. 3 Automatic Loaders.
2—Clarkson Loaders, 26" above rail.

CONVEYORS

2—Joy 30" Underground Belt Conveyors, 500' to 2000' each. Excellent.
2—Goodman 97-C, 36" Conveyors, 1500' long.
3—Robins 30" Belt Conveyors, 200' to 2000'.
4—Jeffrey 52-B, 30" Drive and Tail Assembly, complete.
2—Joy MTB 30" Drive and Tail Assembly, complete.
3—Goodman 97 HC 30" Drive and Tail Assemblies, complete.
8,000' Conveyor Belt, 30".
10,000' Conveyor Belt, 26", like new.
8—Jeffrey 61AM 12" Chain Conveyors, 300'.
2—61EW Elevating Conveyors.
2—61WH 15" Room Conveyors, 300'.
2—Joy 15" Room Conveyors, 300'.
2—Joy 20" Conveyors, 300'.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.

CONVERTERS AND DIESEL PLANTS

1—300 KW Portable Rectifier, excellent.
2—100KW, G.E. TCC-6's, 275 volt, Rotary Converters.
1—150KW, G. E. HCC-6, 275 v., Rotary Conv.
1—150KW, 6 phase, Allis Chalmers Rotary Converter, 275 DC.
1—200KW Allis Chalmers Rotary Converter, 6 phase, 275 DC, perfect.
1—200KW, G.E. HCC-6 Rotary Converter, 275 volt DC, newly rewound.
1—300KW, G. E. HCC-6 Rotary Conv., 275 DC.
2—300KW Westinghouse, 6 phase, Rotary Converters, 275 volt DC.
2—200KW Westinghouse Rotary Converters, 275 volt DC.
2—200KW Westinghouse Rotary Converters, 275 DC, newly rewound.
(all the above with 6900/13000 and/or 2300/4000 primary transformers)
2—150KW MG Sets, G. E. and Westinghouse.
1—200KW MG Set, Westinghouse, rebuilt.
1—200KW MG Set, General Electric, perfect.
2—150KW Allis Chalmers MG Sets, 275 DC volt, excellent, 220-440 AC volt.
1—300KW Westinghouse, 600 volt MG Set, rebuilt.
2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
2—500KW Westinghouse, 600 volt, DC, 6 phase, Rotary Converters.
2—500KW HCC-6 Rotary Converters, 6 phase, 600 volt DC.
1—GMC-471 Diesel with 60KW, 250 volt DC Generator.
1—GMC-671 Diesel with 75KW, 250 volt DC Generator.
1—GMC-671 Diesel with 110KW, 250 volt DC Generator.
1—Cummins 125 KW, Diesel with 250 volt DC Generator.
1—Allis Chalmers Natural Gas Engine with 100 KW Generator, 275 volt DC.
Boilers, like new, 500 H. P.

MISCELLANEOUS

5—Complete Tipples, 3 to 5 Track. Wood and Steel.
20—Jeffrey Melveyors on rubber tires.
1—¾ Yard Shovel and Back-Hoe.
1—¾ Yard Crane on Cats.
Battery Supply Tractors, rubber tired.
1—Cantrell Air Compressor on rubber tires.
10—Air Compressors, 1 H.P. to 40 H.P.
2—Joy self propelled rubber tired compressors, 240 cu. ft.
2—Acme self propelled rubber tired compressors, 130 cu. ft.
40 Mine Pumps, all types.
1—Differential 40 Passenger Man-Trip Car.
6—MSA Rock Dusters.
2—Phillips Carriers, 44" and 48" Ga.
1—Barber Greene self propelled Bucket Elevator.
Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
300 Mine Cars, drop bottom, 42" Ga.
30 Mine Cars, drop bottom, 44" Ga.
100 Mine Cars, 18" high, end dump, 44" Ga.
300 Mine Cars, end dump and drop bottom, 20" high, 48" Ga.
1—10 ton Mine Car Scale with Recorder.
15—Brown Fayro HKL and HG Car Spotters.
1—12 ton Differential Slate Larry.
Inclina Hoists, 25 to 50 H.P.
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1—Jeffrey 6' Aerodyne Fan.
1—Jeffrey 8' Aerodyne Fan.
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1—Storage Tank, 10,000 Gallons.
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1—Goodman G-12½ with Size 1½ Pans
1—Goodman G-15, Side Drive
Size 1 or 1½ Duckbills
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1—Westinghouse 907 Locomotive
1—Jeffrey MH-88 Locomotive
1—Jeffrey MH-96 Locomotive
1—Goodman 30-B Locomotive
1—8-30 Goodman Locomotive—22" High
1—10-30 Goodman Locomotive—24" High
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Slate Larry—Scoopmobile
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2—Sullivan 11B Machines
1—C-E-6 Sullivan—42" Gauge Trucks
1—212-AA Goodman—Low Vein Trucks
1—212-AA Goodman—Standard Trucks
1—212-AA Goodman—Bowdil Bar
1—212-AA Goodman, without Trucks
1—Set Mine Car Scales
1—GMC Diesel Power Plant
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Drop Bottom Cars, 42" Gauge, 25" Above Rail
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40	Century B.B.Drip - New	DN-375	1800
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30	West S.B. Open Shunt	SK-113	1200
25	G.E.TEBB-New	CD	1800
25	West.TEFCBB-XP	SK-83.3	1800
25	West.S.B.Open	SK-100L	1200
25	G.E.B.B. Shunt	CD-93	1200
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1—Jeffrey 52B 26" Belt Conveyor, 1,000' centers, complete
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2,450'—26" Joy MTB Belt Conveyor
19—26" Belt Drives of various types
360'—24" Goodman Belt Conveyor, complete
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12—19" Long Chain Conveyors, 350' centers complete w/400 DBH Long mobile head drive, 25 h.p. Motor, 250 V. D.C., cat mounted
4—19" Joy Chain Conveyors, Permissible
24—15" & 12" 61W, 61HG, 61W and 61AM Jeffrey Chain Conveyors
7—G12½ Goodman Shakers, complete w/10' 21½ pans
10—G12½, G15 and G20 Goodman Shakers
29—Goodman Power Duckbills, Model 477
2—PT12 Long Piggyback Conveyors
2—PT15 Long Piggyback Conveyors
10—PT15-B Long Piggybacks with 5 h.p. 250 V. Motors

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1—11RU Joy Cutting Machine, 9' Bar, 250 V. D.C.
5—Long 88 Pig Loaders
2—20BU-3E Joy Loaders, 250 V. D.C.
1—14BU-7RBE Joy Loader
1—14BU-7RAE Loader, 250 V. D.C.
2—14BU-3PE Joy Loaders
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8—8SC3CE Joy Shuttle Cars
17—8SC Joy Shuttle Cars
1—8SC7BXE Joy Shuttle Car
3—8SC Joy Shuttle Cars, Elevating Discharge
2—8SC Joy Shuttle Cars, Matched Pair
2—32D Joy Shuttle Cars
2—32E7 Joy Shuttle Cars
2—32E10 Joy Shuttle Cars, Rebuilt
1—32E16X Joy Shuttle Car, Rebuilt
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2—600 & 800 Auto Transformers
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5—7AU Sullivans
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17—11B Sullivans, 35 & 50 h.p.
15—12AB & 12AA Standard Goodmans
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2—20 Ton MH77 Jeffreys, 42" t.g.
1—15 h.p., HM82B G.E. Locomotive, 90 h.p. units, 44" O.H., 48" t.g., Excellent
8—13 Ton Locomotives, 250 Volt, any gauge
1—12 Ton 29B Goodman Locomotive, 46" O.H.
9—10 Ton Locomotives, 250 Volt, any gauge
15—8 Ton Locomotives, 250 Volt, any gauge
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1—6 Ton Battery Locomotive—NEW
27—6 Ton Locomotives, any gauge
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24—4 Ton Locomotives, 250 V., any gauge
1—4 Ton G. E. Battery Locomotive
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1—CMI Coal Dryer, 48" Excellent
1—Heat Dryer, Complete
1—Marion Double Roll Primary Crusher
1—24" x 36" Pa. Single Roll Crusher
1—30" x 30" Jeffrey Single Roll Crusher
2—24" x 24" Jeffrey Single Roll Crushers
1—3' x 14' Double Deck Vibrator
1—4' x 12' Double Deck Vibrator
1—3' x 8' Low Head Vibrator
5—Jeffrey Traylor Vibrator Feeders
4—Jeffrey Traylor Vibrator Screens
1—Magnetic Separator, Complete
1—Set Jeffrey Dewatering Screens
3—Scraper Conveyors of various sizes
10—Tipple Belts from 15" to 42" width
1—30" x 42" Loading Boom
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148—44" t.g. Drop Bottom Cars, various sizes
334—44" t.g. End Dump Cars, various sizes
305—48" t.g. S. D. Drop Bottom Cars 22" O.H.
4—56½" t.g., 3 Ton, 4 Wheel Push Trucks

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816—Tons 30, 40, 56, 65 & 70 lb. Relaying Rail
4,200'—1,000,000 CM Feeder Cable, insulated
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3,107'—750,000 CM Bare Copper Feeder Wire
3,474'—350,000 CM Insulated Copper Feeder Wire
681'—300,000 CM Insulated Copper Feeder Wire
500'—4/0 Stranded Insulated Copper
17,757'—4/0 Trolley Wire
7,036'—6/0 Trolley Wire
1,250'—2 Section Trolley Wire
70,444'—4/0 Stranded Highline Wire
17,031'—2/0 Stranded Highline Wire
78,370'—1/0 Solid Copper Trans. Line
42,926'—#2 Stranded Transmission Wire
10,662'—#6 Solid Copper Transmission Wire
3,960'—4/0, 3 Cond. Neoprene Covered Cable
950'—2/0, 2 Cond. Anhydrex & Lead Covered Cable

MISCELLANEOUS

5—HKL Brown Fayro Car Spotters
7—CH Sullivan 5 h.p. Car Spotters
1—HKG Brownie Layer Loader Hoist
91—Hoists from 5 h.p. to 800 h.p.
6—Shop Constructed Jeeps, track mounted
599—Stationary Motors: ½ to 800 h.p. of various specifications
1—Prefab Building, 40' x 84'
1—Prefab Building, 12' x 120'
108—Pumps from ¾" to 4500 GPM of various specifications
1—10 h.p. Deming Deep Well Pump
1—330 GPM, 6" Pomona Deep Well Pump
1—14" Centrifugal Slurry Pump, w/15 h.p. Motor
3,310'—3½" Galvanized Pipe
903'—1½" Black Pipe
1,000'—2" Plastic Pipe
25,765'—2" Black Pipe
500'—4" Black Pipe
47—Room Blowers: Brown Fayro & Jeffrey
30—Mine Fans from 30" to 6' Hi Pressure
102—Coal Drills, 571CP, 572CP, 573CP, 473 CP, A6 and A7
1—WK29 Sullivan Air Compressor, 120 cu. ft. capacity, 48" t.g.
2—Cantrell Compressors, 120 cu. ft. capacity 48" t.g.
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1—Canton Track Cleaner, presently 48" t.g.
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"We have increased production 35 to 40% since we put the D9 to work on our stripping operation."

That's a direct quote from Superintendent M. D. Turner of the Blackwell Coal Co.'s strip mine at Adamsville, Alabama. And he goes on to say:

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There's a wide choice of features to like best when you talk about the mighty 320 HP Caterpillar D9 Tractor. For example, the D9 now features lifetime lubricated track rollers and idlers. That's right—lifetime! This means that time-consuming on-the-job lubrication is eliminated. No lubrication is required until rebuilding.

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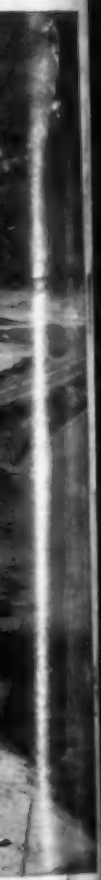
ONE OF NINE Link-Belt coal washers at the plant is seen in background. These heavy-media, tank-type vessels employ the principle of float-sink separation in a mixture of water and magnetite. One of them is used for further processing shale refuse to produce feed for the lightweight aggregate plant.



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